Electrical World

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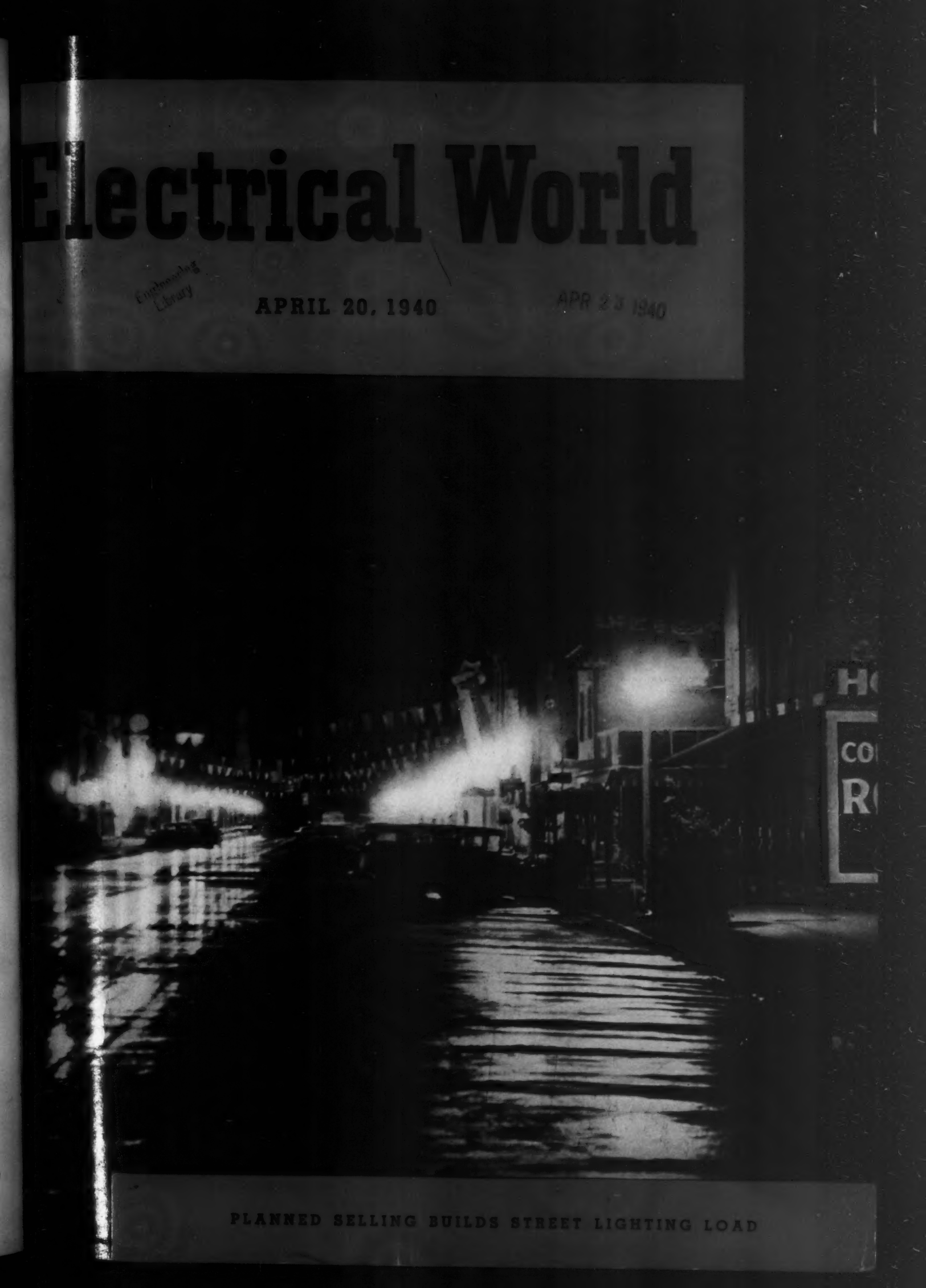

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Why Private Ownership

What has private ownership in the utility field given to this country? We hear a lot about the preservation of private initiative, so perhaps it might not be amiss to find out what there is to it.

First and foremost, it provides through research a better and less expensive service. This point was brought out strongly last week by managers of two well-run municipal plants. In talking to an ELECTRICAL WORLD editor these men said that they had nothing to show him because they were conservative. They did nothing new until private utilities had first tried it out and demonstrated its value.

Second, private utilities must continue to grow so that profits can grow. To do so they must build load, which in terms of the homes of this country means greater convenience and comfort as well as better living.

Third, and closely associated with the foregoing, is the competition from other sources of power, to combat which the utilities have had to offer a better service at less money to commercial and industrial customers. In accomplishing this the utilities were instrumental in building up the volume of low-priced power behind the worker, thereby enabling him to turn out a volume of product which most people could afford to buy.

Fourth, private ownership has demanded of the manufacturer not a product made to a specification, whereby price was the sole determining factor, but a better product. The result has been constant improvement, with the customer benefiting.

True, none of these are denied public ownership, and in fact some municipal operators work on those very bases. The facts are, however, that municipal ownership seldom provides the funds for research. Because its eye is so closely held on the voter, or residential user, its commercial and industrial rates are not so conducive to power load. Nor is there the financial incentive to expand or to be constantly improving the system.

Does the public know and understand that almost every appliance in the home was pioneered by the utilities? That improved home lighting and eye conservation can be attributed almost entirely to private initiative? That without the sales efforts of utilities more than half the homes in this country would still be using oil lamps, factories would still be using antiquated forms of drive and stores would be deprived of the pulling power of windows?

Has the job of improving electric service to home, business and industry been completed and can we turn it over to a type of operation that does not possess the same initiative?

This is the year when private operation must be sold to the American people. Let's see that the people know what we are talking about and how it benefits them.

Integrated Supply Improves Service to Welders

Utility substation arrangement co-ordinated with plant interlaced bus scheme in Midwest steel plant to serve 11,000-kva. welder load*

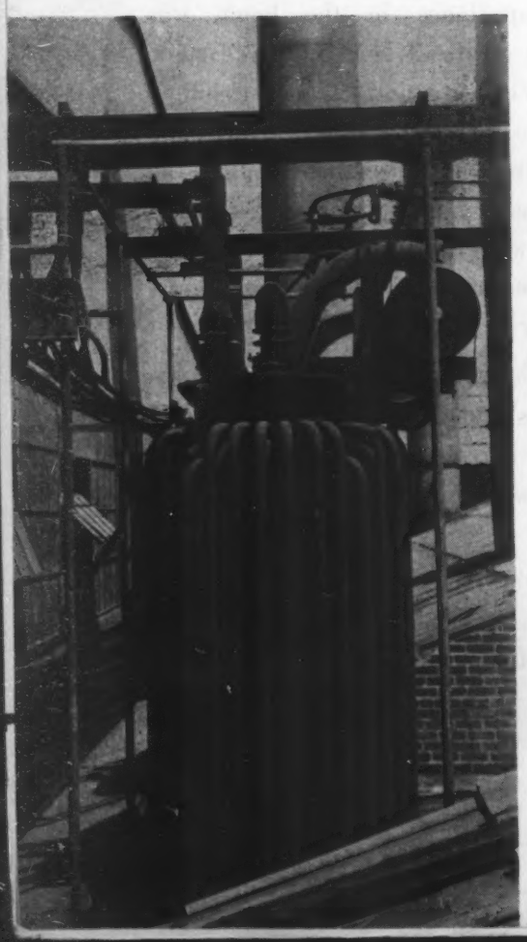
W. B. HURLEY† and WILLIAM SMITH‡

GOOD REGULATION, highly desirable in any electrical supply system, is doubly essential in bus systems that carry the heavy, low power factor single-phase currents for resistance welding loads. Corollary requirements of these systems are low bus resistance and reactance, demanding short runs between transformer and load, as well as close conductor spacing.

In the plant of the Midland Steel Products Company, Detroit, a resistance welding load of 11,000 kva. aggregate nameplate rating is supplied over an integrated system in which utility substation arrangement has been effectively co-ordinated with a distribution system in the plant which incorporates the "interlaced bus" idea.

The total cumulative voltage drop for this system from utility substation to the largest welder, which has a maximum instantaneous demand of 2,100 kva. at 480 volts, 0.4 power factor, is 13 per cent. Of this drop 1.2 per cent is in 100 ft. of interlaced bus included in the circuit. The flicker at the substation bus is 3.5 per cent.

WELDING SUPPLY TRANSFORMERS on roof over load centers limit length of bus runs. Two (one behind other) of six 1,000-kva., 4,800/480-volt welding transformers serving feeder C. Transformers are arranged two per phase in parallel



Utility Substation

The two 4,800-volt feeders supplying the Midland Steel Products Company plant emanate, as shown in the accompanying diagram, from a 24,000/4,800-volt step-down substation of the Detroit Edison Company. The utility substation contains six 7,000/9,000-kva., three-phase, radially fed transformers which feed six 4,800-volt circuit buses. There were sufficient spare positions available at this substation to allow one of the six circuit buses to be "set aside" to supply the welding load of this plant alone, and thus prevent the voltage fluctuations on the bus due to the welder operations from affecting service to other plants.

New Load Provisions

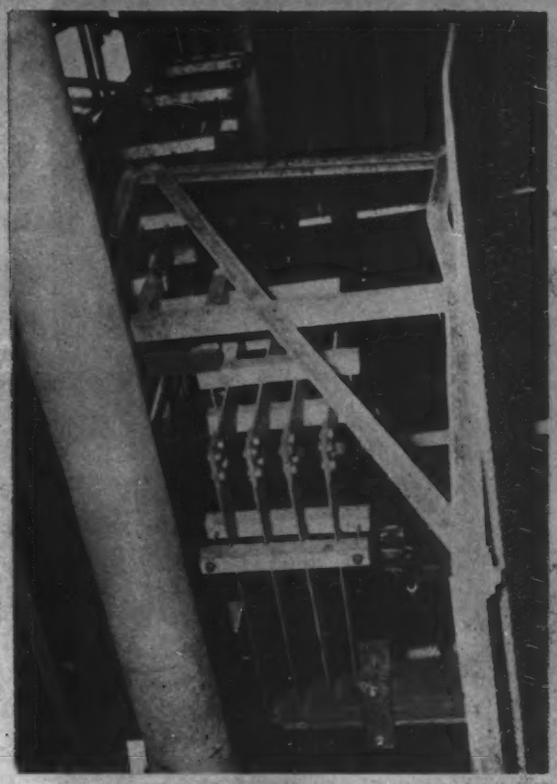
At present the welding circuit bus carries only the load of the one line. However, the transformer supplying it is still connected to other circuit buses through a reactor and linkage bus and consequently serves as a reserve capacity for other circuit buses. If load on the substation increases and the spare positions on the bus are needed for new load it may be that enough of this new load may be "flicker load," in order to provide more satisfactory loading on the transformer.

Another alternative might be to use the flicker bus positions as throw-over lines to other plants.

A double-bus arrangement is also used in the primary bus room of the industrial plant, with a 4,800-volt feeder from the utility substation supplying each bus. General plant load is consolidated on one of these buses, while the three "welding feeders" are operated on the throw-over bus supplied from a separate feeder. Two of the three 4,800-volt welding transformer feeders (A and B in the diagram) serve general plant load as well as welding load, but the third serves welder load alone. The welding transformers, in order to keep the length of bus runs down, are located at three different parts of the plant, at their respective load centers. Welding

*Based in part upon data originally prepared for A.I.E.E. subcommittee report, "Power Supply for Resistance Welding Machines II—Resistance Welder Installation."

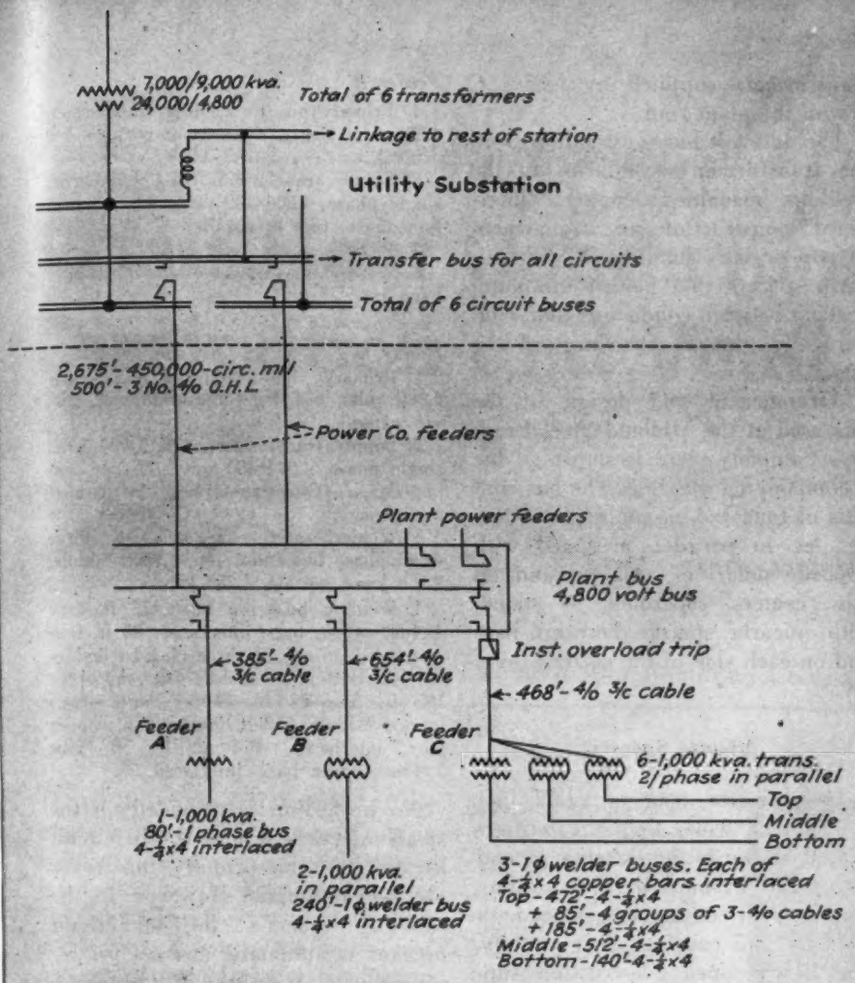
†Staff engineer, sales department, Detroit Edison Company. ‡Welding engineer, Midland Steel Products Company, Detroit, Mich.

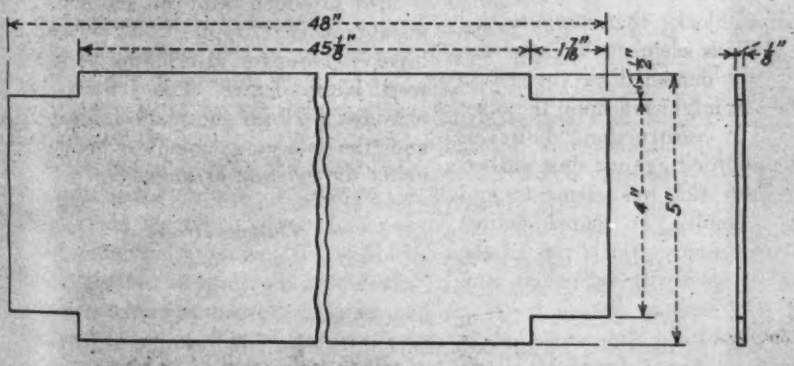


DOWN FROM THE TRANSFORMERS on the roof. Looking up through buswork connecting an interlaced bus run in the plant with the welding transformers on the plant roof

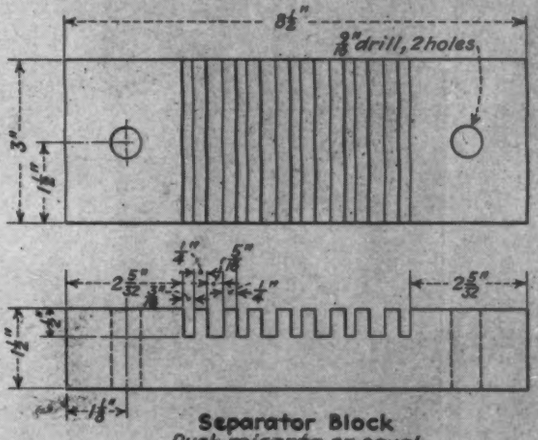
ARRANGEMENT of welding supply system for Midland Steel Products Company (upper left)

DETAILS of "interlaced bus" design (below)

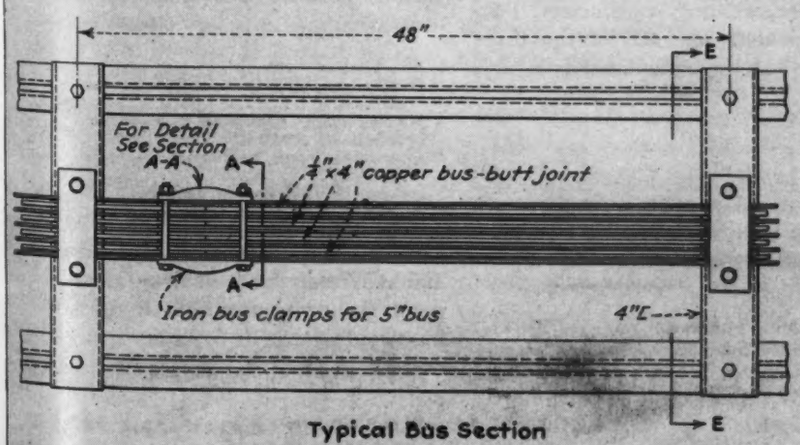




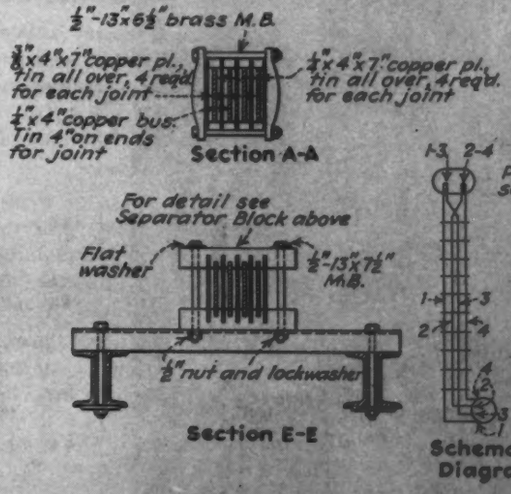
Bus Separator
Duck micarta or equal

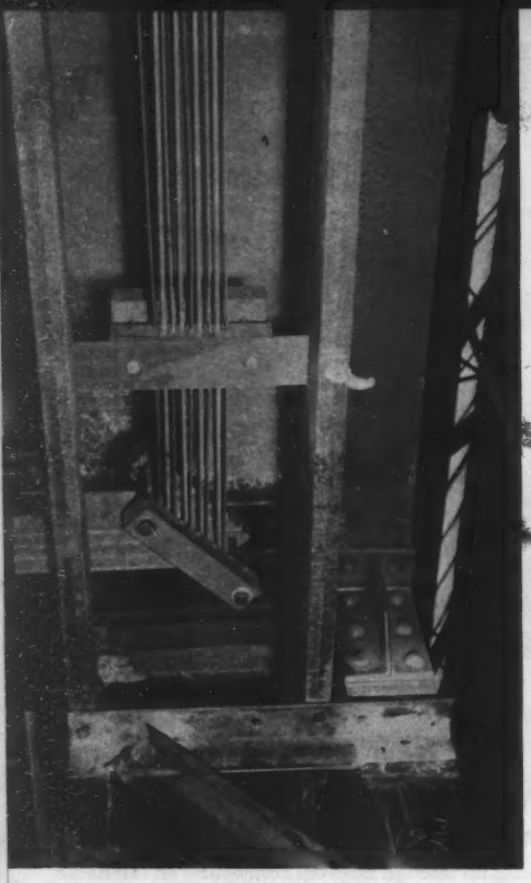


Separator Block
Duck micarta or equal



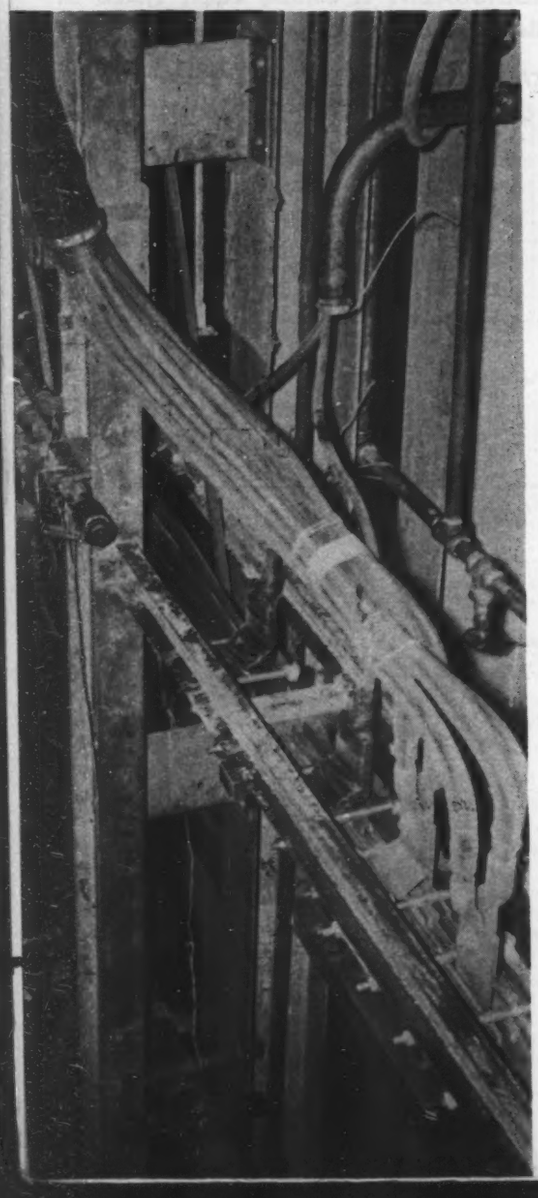
Typical Bus Section





Right angle in interlaced bus run

Tap off from the bus to adjacent welding machines



transformers supplied by feeder C are on the plant roof.

The 480-volt buses extending from the transformer secondaries to the welding machines employ "interlaced" construction, an arrangement of copper bars interleaved with micarta spacers that permit minimum spacing between conductors and, consequently, reduces reactance of the bus.

Arrangement and design of the bus used at the Midland Steel Products Company plant is shown in the accompanying diagram. The bus consists of four ¼x4-in. copper bars, two per leg in parallel, arranged with opposite polarities adjacent and on 1-in. centers, separated, as stated, with micarta spacers between bars and on each side of the entire assembly.

Micarta Spacers

The micarta spacers (⅛x5 in.) are an inch wider than the busbars and, as shown in the sketches, extend above the busbars to keep falling objects from coming in contact with the bars and causing short circuits. The bus is open construction supported from building pillars. Micarta is used for both the separators and the spacer blocks that support and clamp the bus elements because micarta is not damaged by the action of oil which might fall upon the open bus. The construction, however, must be guarded against dust gathering between the bus elements and causing a fault. To guard against this contingency vertical runs of the bus are wrapped with varnished cambric tape to exclude dirt.

The cost of the bus installed is estimated to range from $9.50 to $10.50 per foot, depending on local conditions.

Feeders

Feeder, welding transformer, load and bus data on each of the three feeders can be summarized as follows:

Feeder A

1. Primary bus to welding transformer—4,800 volts, 350 ft. three conductor, No. 4/0 cable.
2. Supply transformer—1,000 kva., 4,800/480 volts, 4.6 per cent impedance, single phase.
3. Welding equipment totals—3,400 kva.
4. Welder bus—80 ft. 4¼x4 in. copper bars, interlaced.

Feeder B

1. Primary bus to welding transformer, 4,800 volts, 654 ft., three conductor, No. 4/0 cable.
2. Supply transformers, two, 1,000 kva., single phase, 4,800/480 volts, 4.6 per cent impedance, two in parallel.
3. Welder rating total—1,700 kva.
4. Welder bus—240 ft. 4¼x4-in. copper bars, interlaced.

Feeder C

1. Primary bus—welding transformer 4,800 volts, 654 ft., three conductor, No. 4/0 cable.
2. Supply transformers, six, 1,000 kva., single phase, 4,800/480 volts, 4.6 per cent impedance (two transformers in parallel per phase).
3. Welder rating—on each of three single-phase bus runs: top, 1,960; middle, 2,750 kva.; bottom, 1,250 kva.
4. Welding bus—top bus, 472 ft. four ¼x4-in. copper bars, interlaced; 85 ft. four interlaced groups of three No. 4/0 cables on 4-in. centers to another bay and there 185 ft. four ¼x4-in. copper bars, interlaced. Middle, 512 ft. four ¼x4-in. copper bars, interlaced. Bottom, 140 ft. four ¼x4-in. copper bars, interlaced.

No protection is provided on the smaller feeders A and B. Oil circuit breakers in the primary bus room are non-automatic. However, in the case of feeder C the oil circuit breaker is automatic and set for instantaneous tripping on overload. The utility company's incoming line is also provided with an automatic, instantaneous tripping oil circuit breaker. However, it is doubtful if a worth-while degree of selectivity is obtained between the plant feeder C and the power company's breaker under the existing arrangement.

Voltage Drop

Tests on the largest welder, 750 kva. rating, shows maximum swings of 1,760 kva., 4,300 amp., 418 volts at 0.299 power factor (2,100 kva. at substation).

Based on a load of 2,100 kva. at 480 volts, 0.4 power factor, tests showed cumulative voltage drops at various parts of this system as follows:

1. At substation, 4,800-volt bus (per cent)	3.5
2. Plant primary bus room, 4,800 volt bus (per cent)	6.4
3. Welding supply transformer primary (per cent)	7.1
4. At welding supply transformer secondary (per cent) (2—1,000 kva. in parallel)	11.8
5. At welder 100 ft. of 4¼ x 4-in. (per cent)	13.0

Since these drops are cumulative and represent the load drop at each point the drop over 100 ft. of the bus would be item 5 minus item 4, or 13.0 — 11.8 = 1.2 per cent.

Vaults for A.C. Secondary Networks—II*

Vault Heat Conduction, Dissipation and Ventilation

Survey shows prevailing trends of design for the disposal of energy losses by fans and natural ventilation — Design charts present vent areas and heat dissipation

JOHN S. PARSONS, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

TO UTILIZE the full capacity of the equipment installed in a vault it is necessary to provide adequate means for dissipating the heat generated by the losses. This heat is dissipated by conduction through the walls and by ventilation. Usually conduction through the walls will dissipate only a small part of the heat and adequate ventilation must be provided to carry away the greater part of it. Because of this, the losses to be dissipated need have little or no influence on the size of the vault.

Since ventilation is the most important factor in the dissipation of losses from a vault, it should be carefully planned to insure, if possible, keeping the temperature of the air around the equipment in a vault at 40 deg. C. or less at all times. The ventilation may be either one of two types, namely, forced circulation by means of a blower or blowers, or natural circulation, depending upon the difference in the air temperature inside and outside the vault to set up the necessary currents. A third possibility, of course, is a combination of the two above-mentioned types of ventilation.

Where the combination of natural and forced ventilation is used, natural ventilation is usually depended on until the vault air reaches a relatively high temperature, at which time a thermostat automatically starts the blower, thus supplementing the natural ventilation by means of forced circulation in an attempt to keep the vault air temperature from exceeding 40 deg. C.

A very small percentage of net-work vaults is provided with forced ventilation. Where it is used, it is necessary to determine the amount of air which must be passed through the vault under the most severe temperature conditions, arrange the intake and exhaust air ducts, which are usually 6 to 10 in. in diameter, so that the air passes around the transformer or transformers, and provide adequate blowing equipment to circulate the required volume of air when taking into account the friction in the duct system. The great majority of network vaults depend upon natural ventilation to dissipate most of the heat from the installed equipment, and it is much more difficult in these cases to design an adequate ventilating system than it is when using the more expensive forced ventilation.

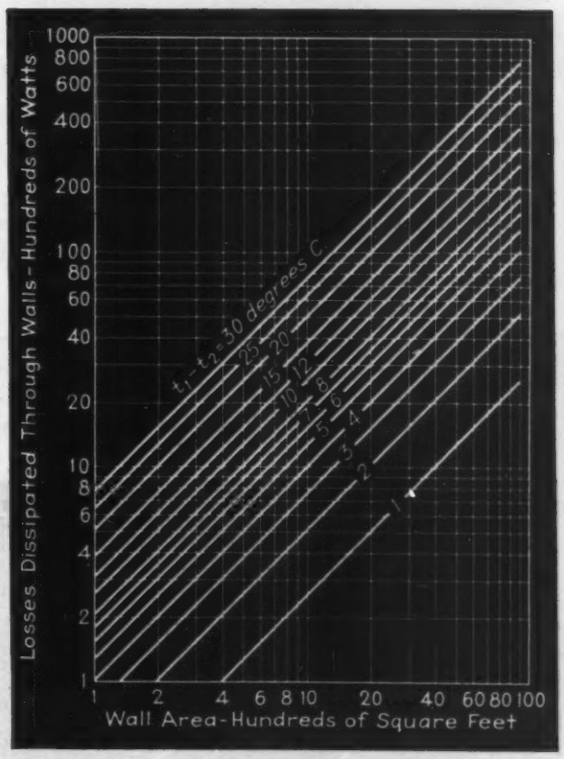


FIG. 1—Heat losses dissipated through wall of transformer vaults. Values given directly for 12-in. concrete; for other thicknesses apply factor *M* from Fig. 2

Adequate inlet and exhaust openings must be provided from the vault to the outside air and properly located so that sufficient air will circulate through the vault around the equipment to carry the heat away. Too small or improperly located vents will not permit the passage of sufficient air, will cause dead spots where the air does not circulate freely, or

*The third installment will appear in an early issue of "Electrical World."

will cause recirculation of air within the vault. All or any of these conditions probably will result in the vault air around some of the equipment exceeding 40 deg. C.

Detailed dimensions and arrangement of the vent openings and ventilating ducts will depend largely on the design of the vault; however, the inlet and exhaust vents should be located in opposite ends or corners of the vault so that the air in passing from one to the other will flow around the transformer or transformers.

Arrangement and Area of Vents

In a majority of the earlier network vaults it was the practice to use a vent shaft and bring the inlet vent opening down near the vault floor. The exhaust vent was located in the roof of the vault. More recently satisfactory natural ventilation has been secured by eliminating the vent shaft and using two openings in the vault roof, both of which serve as inlet and exhaust vents. At the present time there are probably more vaults employing this arrangement of vents than there are with the inlet vent brought down near the floor. The two vent openings in the majority of vaults have the same net area. Where there is a difference in the net area the inlet vent is usually the larger, although not always.

The total net vent area in square feet per kilowatt loss varies from 0.43 to 4.82 in the vaults studied, which employed natural ventilation. The average for all of these vaults is 1.55 sq.ft. per kilowatt loss. In those vaults employing inlet vent shafts the total net vent area in square feet per kilowatt loss varies from 0.95 to 4.82 and averages 1.60, while the vaults without an inlet vent shaft—that is, the vaults with all vent openings in the roof—have a variation in the total net vent area of from 0.43 to 2.16 sq.ft. per kilowatt loss and an average of 1.49 sq.ft. per kilowatt loss. This would seem to indicate that a single inlet vent shaft does not improve the natural ventilation and its expense and the extra space taken by it are not justified.

Most of the extra space taken by the vent shaft can be eliminated, however, by making it serve as entrance and working space in addition to ventilating space. This is sometimes done by using the inlet vent as an entrance opening, locating the ladder in the vent shaft and placing a fire door of transite or metal in the partition between the shaft and the vault proper. When the door is open the space taken by the shaft also serves as working space.

Use of two inlet vent shafts, one at each end of the vault with the exhaust vent near the middle of the vault, probably would improve the ventilation; however, it is doubtful whether such a design can be justified economically. In the vaults analyzed using an inlet shaft, the top of the vent opening into the vault above the vault floor varies from 12 to 48 in. and averages 22.6 in. The vertical distance from the street opening into the vent shaft to the top of the inlet vent opening into the vault varies from 6 to 19.5 ft. and the average distance is 8.75 ft. The depth of the vaults which do not have an inlet vent ranges from 6 to 12 ft., the average depth being 8.25 ft.

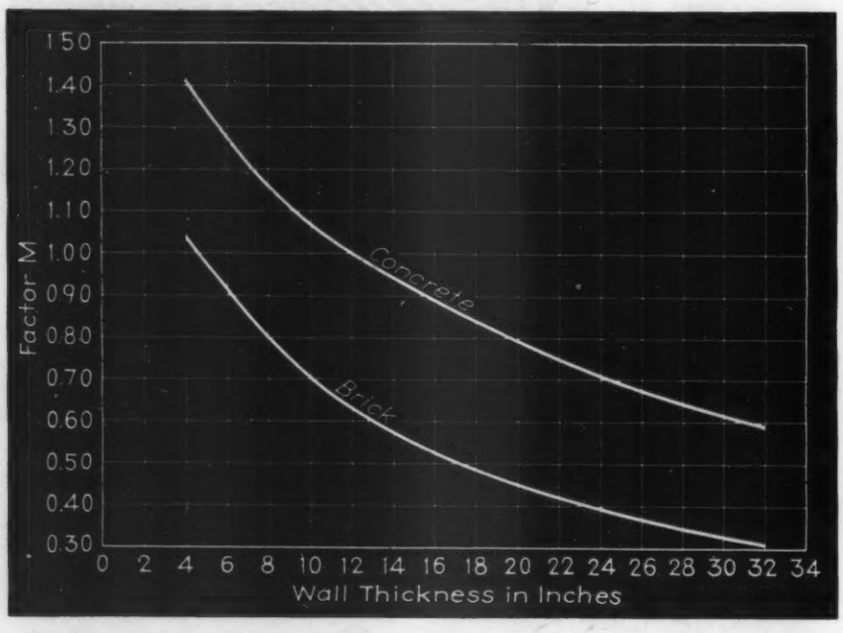


FIG. 2—Relative amount of heat losses dissipated through concrete or brick vault walls of various thicknesses. Factor M is to be applied to values derived from Fig. 1

Conduction Through Walls

Because of the many variables and assumptions necessary, it is very difficult to determine accurately by calculations the amount of heat which will be dissipated through the walls of a vault and the net area of the vent openings necessary to permit the heat which is not conducted through the walls to be carried away by natural ventilation so as to keep the vault air at 40 deg. C. or less. A fairly good approximation can be made, however, of the heat disposed of through the walls and the net area of the inlet and exhaust vents necessary by the following method using the curves of Figs. 1, 2 and 3.

Dissipation of heat through the walls of a vault depends upon the material, area and thickness of the walls and the temperature of the inside and outside surfaces of the walls. It is necessary to exercise considerable judgment in assuming the temperature difference through the walls to be used in determining the heat dissipated. For example, temperature conditions will usually be such that the area of the vault roof should be omitted from the calculation. If the vault has one or more sidewalls common with a basement or another vault, this common area should usually be omitted from the calculations. The proximity of steam mains, duct lines, soil with considerably lower than normal heat conductivity, etc., should be considered.

Effective ambient temperature in the vault should be limited to 40 deg. C. to permit the installed equipment to be operated at rated load continuously. Effective inside wall surface temperature will be less than 40 deg. C., because the temperature of the air approaching the transformer or transformers must be considerably less than 40 deg. C. in order that the effective ambient temperature will not exceed 40 deg. C. Temperature

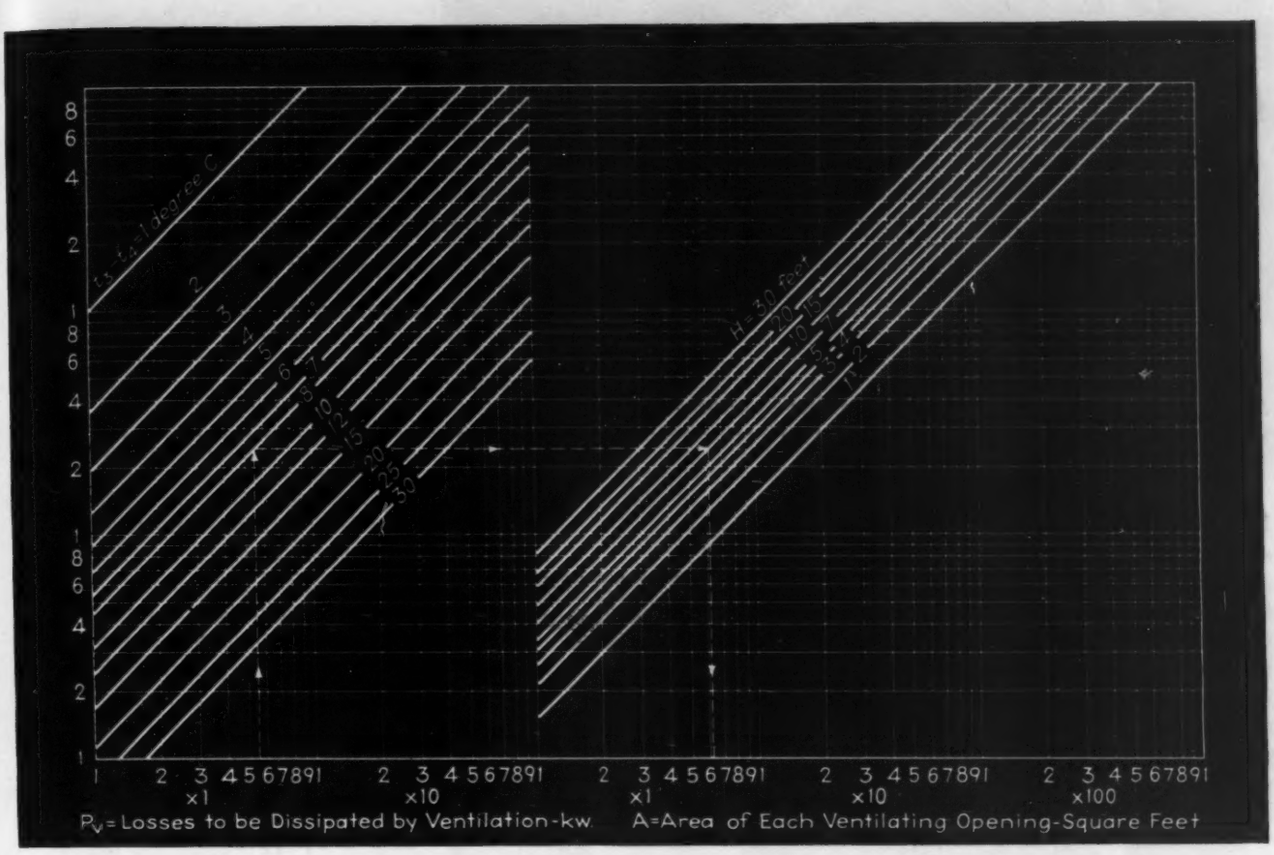


FIG. 3—Net area of each of the two ventilating openings into a transformer vault

Assume a vault 7 ft. deep houses equipment having losses 5.5 kw. more than is dissipated through the walls. Suppose that the outside air temperature never exceeds 27 deg. C. during the period when the specified losses occur, and that the exhaust air temperature is not to rise above 35 deg. C. in order to be sure that the equipment is not subjected to an ambient temperature above 40 deg. C.

To use the curves enter the left-hand group vertically at P_v=5.5 to the curve for $(t_s - t_a)$=8. From that point continue horizontally to the right-hand group for H=7 feet. Then vertically below is the value of 6.1 sq.ft. for the area of each vent opening. This area is the value for both the inlet and exhaust opening or the smaller of the two when an inlet vent shaft is used. If no inlet shaft is used the total area of the vent openings in the vault roof should be *double* the value obtained from the curves. The area of the vent openings is the actual opening or net area and not the gross grating area. Most gratings will have a net area equal to 50 to 65 per cent of their gross area, depending upon the type used.

near the roof of the vault may approach 40 deg. C., but near the floor the temperature will be essentially equal to the inlet air temperature. Maximum mean temperature of the air in a vault adjacent to the walls will usually be about 30 deg. C. if the ambient temperature at the equipment does not exceed 40 deg. C. Temperature of the earth and air outside the walls, floor and roof of a vault will depend upon local conditions, such as location, prevailing air temperatures, exposure to sun, moisture in the soil, type of soil, etc.

Weather records and local observations of soil temperatures should be consulted. The National Electric Light Association summarized some soil temperature measurements made in several cities in the United States. This information* will be helpful in estimating earth temperatures. In the absence of more accurate data on the maximum mean effective earth temperature adjacent to a vault a figure of 20 to 22 deg. C. can be used with fairly good result in most locations.

The curves in Fig. 1 give the amount of heat loss in watts conducted through a 12-in. concrete wall for various temperature differences between the two wall surfaces. The loss dissipated through the wall of a vault is

$$P_W = 0.0005271\ KA\ (t_1 - t_2)\ \text{kw.}$$

where K = the thermal conductivity of the wall in B.t.u. per hour per square foot per degree Fahrenheit difference in temperature.

A = the area in square feet of the wall effective in dissipating heat.

$t_1 - t_2$ = the mean temperature difference through the wall in degrees Centigrade.

$$P_W = 0.0002583\ A\ (t_1 - t_2)\ \text{kw.}$$

when $K = 0.49$

The curve of Fig. 1 was derived from this equation. To obtain the amount of losses dissipated through concrete walls of other thicknesses than 12 in. or through brick walls of various thicknesses, multiply the kilowatt loss dissipated obtained from the use of the curves of Fig. 1 by the proper factor M taken from the curves of Fig. 2.

The losses to be dissipated by ventilation are the sum of the peak load losses of all, transformers, network protectors, cables, buses, and other equipment in the vault minus the amount of losses which are conducted through the vault walls. Usually the greater part of the losses must be carried away by the circulation of air through the vault. When natural ventilation is used the pertinent factors are the amount of losses, permissible temperature rise of the air,

[*Continued on page 123*]

* "Earth Temperatures and Their Use in Rating Cables," N.E.L.A. Publication No. 021, December, 1929.

Customer Service Personalized

Commonwealth Edison shifted customer interviews from counter to desks, to personalize customer contacts and guard privacy — Station arrangement of 15,000-customer groups provides speedy and accurate information

L. L. STARRETT, Commonwealth Edison Company, Chicago*

PROCEDURE for rendering personal service to customers has undergone a very decided change for the better in the utility industry over the past fifteen years. Companies have turned away from serving customers at counters, where every one in line might become acquainted with the business of the others, and today provide individual desks in a single location where the various requests of all customers may be received.

These changes have been made possible by management's concentration on improving customer contacts. Management realizes that it takes time to develop good relations with its customers; that a sudden spurt of a customer relations policy will not win friends immediately. The situation is no different than in our private lives, where our real friends are those we have cultivated over a long period of time.

Interview Desks Provided

The Commonwealth Edison Company changed from counter service for customers to desks in 1927 when it provided desks for application service clerks. This service was extended during 1938 to include both bill service and credit interviews. The effect was noticeable at once. Customers appreciated the privacy of conversations afforded by interviews at individual desks and employees no longer noticed fatigue affecting their attitude toward customers.

This early change, however, did not remedy the then existing condition of serving customers at separate locations for various types of service. Such decentralization of customer service was long prevalent in large organizations.

*Chief clerk, treasury department.

Gradually, various types of customer services have been combined in the Commonwealth Edison Company until at present there is one location where customers call.

This consolidation of customer service was completed in 1938 when the customers department, actually a division of the treasury department, was organized.

The customers department has general responsibility for supplying information and rendering service to customers who call in person on matters involving credit, collections, applications for service, bill adjustments, duplicate bills, meter deposits, merchandise adjustments and other related matters. There are twenty customer service clerks regularly assigned, with facilities provided for thirty-one during peak periods. Relief service clerks are called upon only as required.

In the ten neighborhood electric shops the same complete service is available to customers. The entire company staff is capable of handling 4,226 interviews in an average day; 95,709 in an average month.

While the organization of the customers department provides for a centralization of customer service, there are, however, senior clerks who are responsible for each class of work. These men are capable of handling the most difficult cases as they arise among the service clerks.

Considerable care was used in the selection of new equipment for the customers department. The desks were designed to harmonize with the classic architecture of Customers Hall. It will be noted in the accompanying illustration that the desks have a heavier appearance than the usual stock desk and are designed so that the customer can get his feet under the desk and face the service man without inconvenience. Each desk is equipped with a wastebasket in a drawer, and telephone wires and connections, for appearance purposes, are concealed from the view of the customer. Forms, papers and supplies are in the center drawer. These supplies are maintained in identical order in each desk so that interview men are able to serve customers at any one of the desks provided.

Training Activities

Establishment of the customers department resulted in a considerable combination and realignment of functions. It has been the ultimate goal from the start of the customers department to have every interviewer able to handle all customer requests. In the attainment of this goal employee training was invaluable.

Training work is carried on in the treasury department by the training division. Meetings were immediately scheduled so as to reach the entire group of customer department men at frequent intervals. Old text material was revised and new material was written. Groups were small, seldom more than twelve persons, and so afforded excellent opportunity for discussion of the details of unfamiliar routine. Thus, the difficult initial period was tided over and in a short time the division was functioning smoothly.

In general, the training requirements of the treasury department are:

1. Training must accompany the assumption of new duties and responsibilities by any group in the department.
2. Training should keep employees posted on revised or new forms and routines.
3. Training should acquaint employees with jobs related to their own.
4. Training must give unceasing attention to customer relations.

Service Sampling

To guide training effort and the service of employees who come into contact with customers, our service clerks and tellers may have as an ostensible customer at any time in the day one who is a special employee and is testing his method of handling the every-day requests of our customers. A report of each such interview is prepared in detail and the employee's efficiency is rated on ten points. Did the employee:

1. Wear neat, clean, appropriate clothing?
2. Have clean hands and face (properly shaven)?
3. Show pleasant facial expression?
4. Greet you pleasantly—give full attention?
5. Speak distinctly?
6. Answer all your questions?
7. Make you understand the explanation?
8. Issue orders, "You will have to" or "It's the company's rule"?
9. Use a disagreeable tone or patronizing inflection?
10. Use a polite leave-taking, "Thank you," "Good-bye," etc.?

Efficiency ratings are used as a basis for the training program, and the results of the tests do not disclose the identity of the employee. A summary of test cases containing comparisons by similar types of work is released to departments periodically. The comparisons result in considerable rivalry among departments and tend to stimulate interest in the improvement of service. They also give management a picture of the service given customers. Both supervisors and employees realize that the plan of service testing is primarily designed to aid in improving service to customers.

In large organizations serving the public it is very important that customer service clerks obtain information rapidly and accurately. The entire scheme of improving customer service fails miserably if customers are delayed or given wrong information.

Our customers accounts department at present is in the process of installing a station plan of housing customers' records. Under a station

DESKS where customer interviews company representatives are designed for maximum comfort and convenience

MERCHANDISE CREDIT MEN are located at desks in main electric shop so rapid service can be given customers and privacy is insured

TRAINING MEETING for customers service interviewers; supervisors lead the meetings, which are devoted to customer relations and specific job training discussions

plan of bookkeeping, accounting, meter and other related records are combined in one location and then are split into small operating units or stations. Each station can be reached by telephone by the interview men and any information concerning a customer's account promptly obtained.

Our plan provides that each station contain approximately 15,000 accounts, with one clerk assigned permanently to each station. An important part of his work consists of answering telephone calls from the interview men for information from the meter or ledger records. Meter books and ledger cards for his station are filed within his desk.

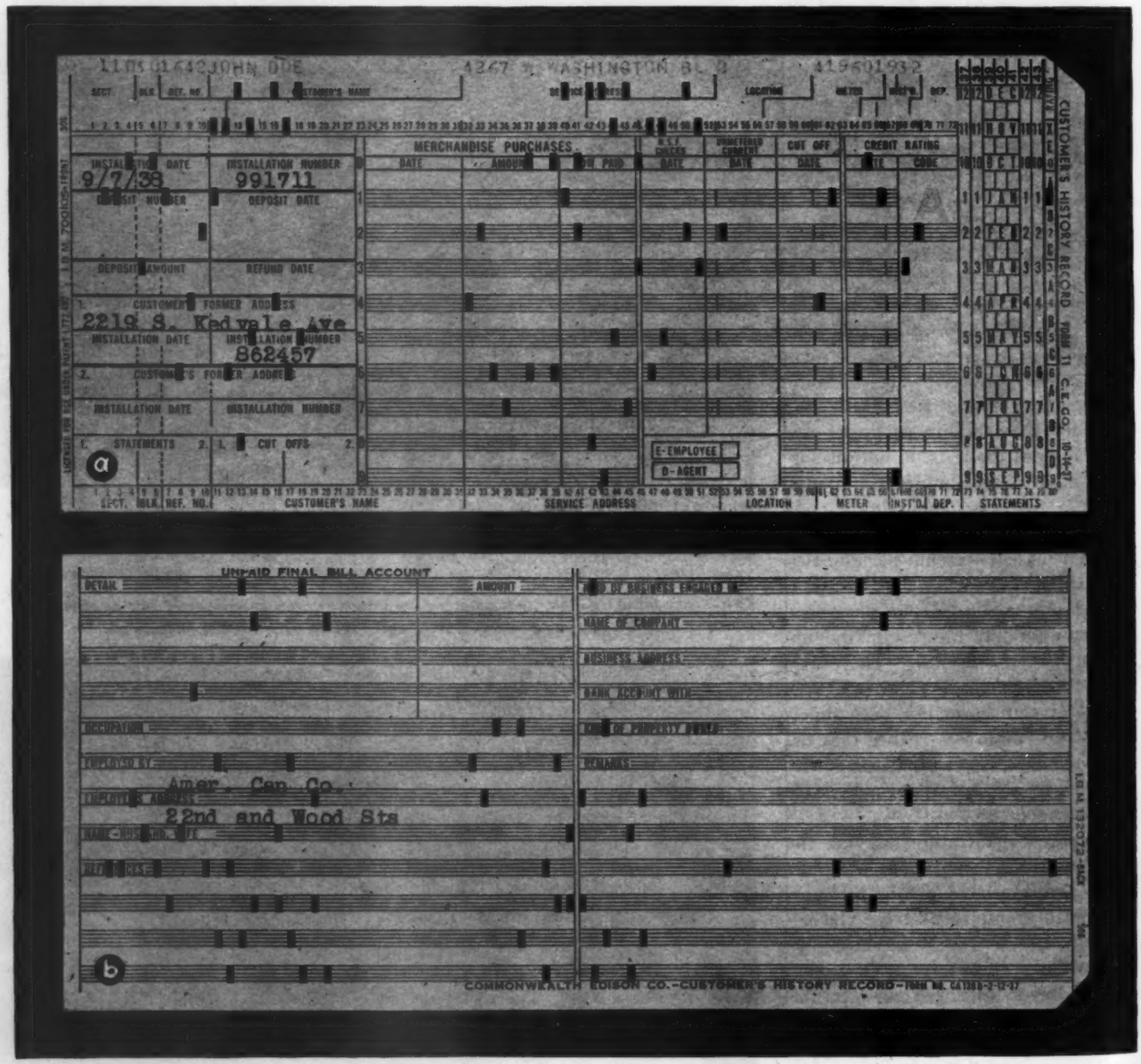
There are several reasons why a station plan furnishes information to the customer service clerks more rapidly: (1) It eliminates walking between records and the communicating system and the necessity of writing down the information in order not to forget it. (2) Confusion at the record files is no longer a problem. (3) Under the station plan of bookkeeping, employees become more familiar with one group of accounts and are less likely to give incorrect information.

Customer History Records

Accurate customer history records are very necessary to aid the service clerks in reviewing credit on light, power and merchandise accounts.

At present in the Commonwealth Edison Company there is being tried a customer history record on a tabulating card. In addition to being a record of the customer's account, this card is also used to prepare delinquent collection statements by use of an alphabetical printing machine.

The customary history card files, as well as the station system of bookkeeping, require a proper communicating system between the service clerks and the supply of information. Automatic telephones have recently been installed in the Commonwealth Edison Company and have speeded up service transactions. However, many utilities prefer direct communicating devices for their service clerks.



TABULATION CARDS used on test as customer history record. Besides giving useful credit and collection information (typewritten), they also provide medium for preparing collection statements quickly on tabulating machine (a) front, (b) rear of card

Turbine Oil Practice

Improved oil has eliminated former operating troubles — No standard practice in specifications, tests or renovation of oils — Cross-section of opinion and practice point out opportunities

ABOUT ten years ago considerable trouble was had with the lubrication of steam turbines. Troubles from sludging and acidity in turbine oil were numerous and work was started to get an improved condition.

A check-up on the situation today shows encouraging progress. Little or no trouble in operation originates from the lubricating oil. Methods have been developed to renovate the oil when it goes bad. Several standard brand oils have been operating successfully for more than ten years. Specification data to get a satisfactory oil are known.

But, despite the progress there is room for more if the replies to questions are indicative of practice and opinion. The freedom from operating troubles due to oil and the relatively low cost of lubrication in power generation have mitigated against engineering studies looking to better oils, lower costs and standard practice to some extent, and it would seem that some degree of standardization can be had. Some properties change oil and treat oil, but others do not. Some properties have arrangements for filtering continuously and some do not. Some properties say they can save money by buying oil on a specification rather than relying upon a standard brand. Treatments and oil handling arrangements vary.

Also, with new units in use and new limits in temperature, turbine lubrication conditions are more severe and turbine manufacturers agree that some study could well be given to turbine oils. None of them now specify the oil to use, but all believe it would be advisable to study the subject with a view to meeting new and old conditions.

It may also be noted that several oil companies have brought out new oils which they claim are better than old oils, but supporting data are difficult to get. Several utility engineers say they will shy off of inhibitors or deoxidizers in turbine oils as they have not been proved up in service. On the other hand, one or two oil manufacturers guarantee a turbine oil to last as long as the turbine in which it is used.

Engineers Report Practices

To cover the situation, questions were asked of outstanding utility power engineers on the largest properties in all sections of the country. The answers to these questions show the wide variety of opinion and practice that exist and should offer a working background for the industry to improve the situation. The questions and answers follow:

QUESTION No. 1—*How frequently do you change the oil in your turbines?*

A. We do not change the oil. At an older station we run the oil through a De Laval separator and then through Richardson-Phoenix oil filter once every three months. At a new station we have bypass filters, through which a part of the oil is filtered continuously and about once a year the oil is put through a De Laval separator. Any loss of oil is made up with new oil.

B. About every five to ten years.

C. Oil is batched every four to six months. A batch or charge is cleared and make-up added and the oil is used over indefinitely.

D. We do not change the oil in our turbines.

E. We have no fixed period. We make frequent tests and change only when the tests show the oil is unfit for use.

F. We do not change turbine oil.

G. We change every four to fifteen years.

H. Our oil changes vary from 15,000 to 50,000 hours of actual turbine operation and the oil is discarded on the basis of observation and analysis, sludge and acidity chiefly governing.

I. We do not change the oil in our turbines.

J. Oil is not changed, as a rule, prior to 20,000 hours of service. A new batch of oil placed in a turbine is used only in that turbine, with losses made up by new oil of the same kind as the original.

K. We change oil only if it breaks down. An acidity of 0.5 is considered the limit.

QUESTION No. 2—*Does the oil change cause you to shut down the machine or is it done as part of a normal shut-down inspection plan?*

A. Work is done on weekends, when machines are out of service.

B. We shut down at our convenience or change oil in conjunction with other work.

C. Oil is changed only when unit is shut down. We have never shut down just to change oil.

D. When a machine is down for overhauling we usually draw off the oil into a dirty tank and allow it to settle, and if it is found to be acidulated we wash it with condensate, and if still acid we add a calculated amount of caustic soda. The oil is then centrifuged and used again.

E. Oil changes are made usually during regular overhaul periods.

F. During triennial overhauls of turbines the oil is removed to a storage tank and it may then be centrifuged or run through a filter before reuse.

G. We change oil at overhaul periods.

H. Normally, oil changes are made at unit overhaul periods.

I. When turbines are shut down for scheduled inspections the oil is drained and centrifuged. If oil appears dirty after centrifuging it is filtered through a flannel filter.

J. Oil is changed when necessary and this may or may not be at the time of a general inspection.

K. Changes of oil are made on predetermined equipment inspection schedules.

QUESTION No. 3—*Do you clean the oil system before you put in new oil?*

A. No.

B. Yes.

C. Yes.

D. ——

E. Yes.

F. No. If a new oil were used we would thoroughly clean the system with a hydrocarbon solvent followed by a thorough flushing with the new oil.

G. Yes.

H. The oil tank, oil coolers, filters and such portions of the system as are easily available are cleaned. Normally, the pipe lines are not cleaned.

I. Oil is drained and reservoir wiped clean.

J. Oil reservoir is thoroughly cleaned.

K. Generally, no, except when oil shows a breakdown.

Question No. 4—*Do you have any operating troubles that originate in the quality of your turbine oil?*

A. No.

B. No.

C. No.

D. Previous to the development of the Funk method of testing the sludging qualities of turbine oils we used to have a great deal of trouble with poor turbine oil. Since then a rapid improvement has been made in turbine oil. For the past ten years we have had no trouble.

E. No.

F. No.

G. No.

H. Not now, but several years ago sludge formation gave operating trouble.

I. No.

J. No.

K. We have had some cases, but they were very few.

Question No. 5—*What are your specifications, if any, for turbine oil?*

A. We purchase only under a brand name.

B. A.P.I. gravity min. 30 deg.; viscosity at 100 deg. F.; 140-155 S.U.; flash, min. 380 deg. F.; fire point, min. 425 deg. F.; neutralization number, max. 0.015 mg. KOH/gm oil; S. E. number, max. 60. No corrosion.

C. We require a light body oil and a low initial acidity.

D. We do not buy on specifications.

E. (1) The oil shall be a filtered neutral oil containing no soap, resin or any material not derived from petroleum. (2) Gravity not less than 28 deg. Be. (3) Flash point minimum 385 deg. F. (4) Viscosity at 100 deg. F. 140-150 sec. S.U. (5) Pour test not more than 40 F. (6) Acid number not more than 0.03; mineral acids shall be absent. (7) Oil shall contain no corrosive sulphur. (8) Oil shall contain no water, grit, dirt or other foreign matter. (9) The emulsion shall break clear in not over 60 seconds and the water below the oil shall be clear.

F. Specific gravity, 0.885; pour point F., 5; flash point F., 385; fire point F., 440; viscosity at 100 F. S.U., 145-155; viscosity at 210 F. S.U. (approx.), 42; neutralization No. mg. KOH/gm oil, 0.025; steam emulsion No. 40.

G. We use no specifications.

H. We use brand and a specification for viscosity.

I. Our specifications cover viscosity, flash and fire, pour, corrosion, steam emulsion and a special requirement such that the oil shall have a high resistance to oxidation in the presence of brass and iron (Farmer Oxidization Test).

J. Viscosity at 130 deg. F., 84; viscosity at 210 deg. F., 48; flash point F., 410; fire point F., 460; resistance to emulsion, 15 in.; neutralization number, 0.024; carbon residue, per cent, 0.015; specific gravity at 60 deg. F., 0.879.

K. Acidity, 0.07; steam emulsion, 67; viscosity (130 deg. F.), 99.

Question No. 6—*What do you do to overcome acidity and sludging?*

A. See answer to No. 1.

B. Use tank continuous filtration system.

C. Centrifuge the batch and allow to settle three or four weeks and add new oil for make-up.

D. See answer to No. 2.

E. We wash the oil with water and then put it through an oil separator.

F. We try to prevent these developments by: (a) Maintain the unit in good condition to prevent admission of water or steam to oil system. (b) Install vents in oil reservoir to remove water vapor before it condenses. (c) Centrifuge the oil continuously by bypassing a portion of the charge. (d) Maintain oil coolers in clean condition. Bearings should not operate at more than 150 deg. F. with normal temperature at about 140 F.

G. We use Funk-De Laval desludging equipment.

H. When analysis shows acidity or sludging the oil is discarded or put through a filter press.

I. No trouble. One turbine using oil specified operated 14,000 hours and showed acidity of only 0.08 mg. KOH and no sludge.

J. We pass oil through a centrifuge when periodic 500-hour tests indicate this to be necessary.

K. Keep water out of the oil and prevent the oil from contact with metal of higher temperatures than the oil will stand.

Question No. 7—*What do you do with old or discarded turbine oil?*

A. All of the oil used for hand oiling, such as governors, valves, gears, etc., is taken from the oil system and new oil is added when necessary.

B. We sell it for a nominal price.

C. It is used over and over and some is used to lubricate auxiliaries.

D. We use it over and over.

E. In most cases we use it on auxiliary equipment.

F. We have no old or discarded oil, but if oil in units reaches a stage that may indicate complete breakdown we would use it for general lubrication purposes.

G. We sell the old oil to the vendor of the new oil.

H. We use it to lubricate other equipment.

I. With new turbines we have no old oil.

J. We use it to lubricate auxiliaries.

K. We burn it under the boilers.

• • •

Repair Generator Shaft in Place

Vertical generator shaft repaired in nine days with aid of rig for supporting revolving element — Customary dismantling of machine obviated

J. H. SIEGFRIED, Pacific Power & Light Company*

QUICK AND PRACTICAL is the method of repairing a shaft in place to which Pacific Power & Light recently restored. Involved was a 3,750-kw. vertical, water-driven unit in Naches power house near Yakima, Wash. This is a base-load plant. The Pelton waterwheel at Naches operates under a 142-ft. head at 300 r.p.m.

The 50,000-lb. revolving element is carried on a Kingsbury thrust bearing, which is supported by a heavy cast-iron cover above the generator. The thrust collar for the Kingsbury bearing is held in place along the shaft by means of a split collar which fits into a groove in the vertical shaft. The thrust collar is keyed on the shaft with a 1½x2-in. key.

This key was broken and there resulted some movement of the thrust collar on the shaft. This chafed the shaft and the bore of the thrust collar. It was necessary to repair these surfaces to make a proper fit.

Such a job usually would require dismantling the whole machine and shipping the revolving field and shaft to some point where there was a lathe large enough to accommodate the piece. Because Naches is a base-load plant and because the failure occurred at a time of year when the machine could not be spared it was decided to attempt repair without dismantling the entire machine.

For this purpose a supporting structure was built up of 6-in. I-beams, to the bottom of which were welded plates to serve as feet. These were so arranged that they could be bolted to the cover of the machine. Made as solid and stiff as possible, the structure was surmounted with an 18-in. ball bearing.

Shaft size at the thrust collar is 7¾in.; at the top, 7 in. This shaft is hollow. Through it the field leads are carried, from a point above the

*Superintendent of power.

slot for the split collar, to a point just above the revolving field. The upper end of the shaft is not occupied, but is threaded to accommodate a 3-in. eye-bolt for lifting the revolving field when assembling or dismantling the unit. Into the top of the shaft was screwed a stud of 3-in. shafting. The other end of the stud was fitted with two nuts as shown, the upper one being a locknut.

Details of Support

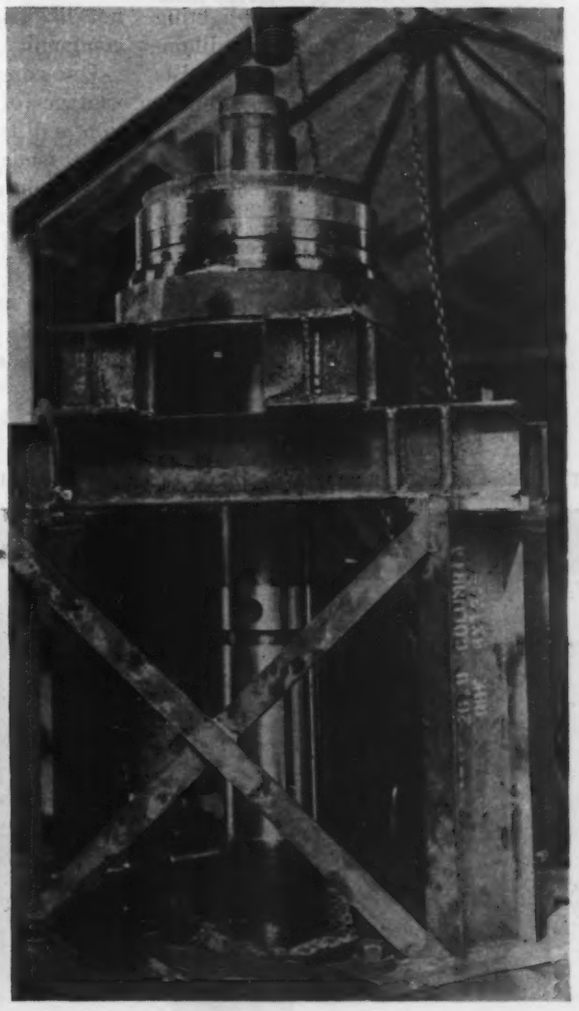
On the I-beam support was placed a circular steel plate, 1½ in. thick, with a hole large enough to accommodate the 3-in. stud. Around the inside and outside of this plate were welded pieces of ⅜x4-in. iron, thus forming a pan with a hole in the center. Through the bottom of the plate holes were drilled and tapped for ¾-in. leveling screws. On top of these screws rested the backing plate for the 18-in. ball bearing. The ball bearing was assembled in position on the backing plate, and above the bearing a 1½-in. steel plate was placed.

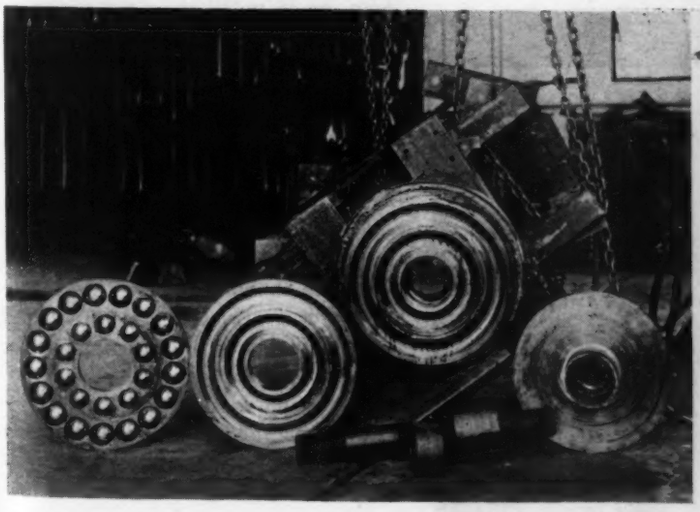
The shaft was then carefully centered and the leveling screws tightened up to hold the backing plate at the proper point, after which the improvised pan was filled with molten babbitt. This provided a solid and well-fitted support for the bearing. The nut on the stud was then turned until the waterwheel runner was clear and all the weight was carried on the thrust bearing. The waterwheel gates were opened and the machine revolved slowly, without variation or wabble. On one side of the I-beam support was attached the table of a milling machine on which was mounted a tool post so arranged that it could be moved vertically.

During the turning process a shaft gage was applied to a smooth point of the shaft below the point where the work was being done. The shaft was found to be running out by only 0.0005 in.

The inside of the thrust collar was built up by electric welding and rebored and both ends were trued up. The keyway had been damaged and was machined true by means of a cutter commonly used for cutting keyways in shafting.

The machine was back in commission within nine days.





UPPER PART of this broken key was so tight it required heavy jackscrew pressure for removal (upper right)

Temporary thrust bearing and supporting structure used in machining the shaft in position. Shaft gage is in place below the machined surface (bottom right)

These are the essential parts of the rig used for supporting the revolving element under repair (below)

Tailor-Made Plans Sell Municipal Lighting

Visual, personalized sales techniques enable utility to increase revenue despite rate reduction — Program has boosted street-lighting levels 32 per cent, fostered public good will

J. D. ORR, Idaho Power Company, Boise*

SOME OF US in the electric industry have been directing our load-building salesmanship almost entirely toward residential, commercial and industrial markets, to the exclusion of anything more than average results from the municipal market. We have seen lighting levels increase in store fronts and neon spectaculars multiply to the point where they outdo street-lighting fixtures in sidewalk and street illumination. Surely a large market exists for better street lighting, to keep pace with constantly increasing standards of illumination in other fields.

The successful merchant of today does not hesitate in setting aside in his budget from 2 to 5 per cent of his gross income for the purpose of advertising and business promotion. He considers the expenditure a good investment. But the cost of modern street lighting is approximately only one-quarter of 1 per cent of the gross business done in the average community, and in many towns we found that this cost averaged even less. If good lighting is good business for the individual merchant, why is it not likewise good business for the community as a whole?

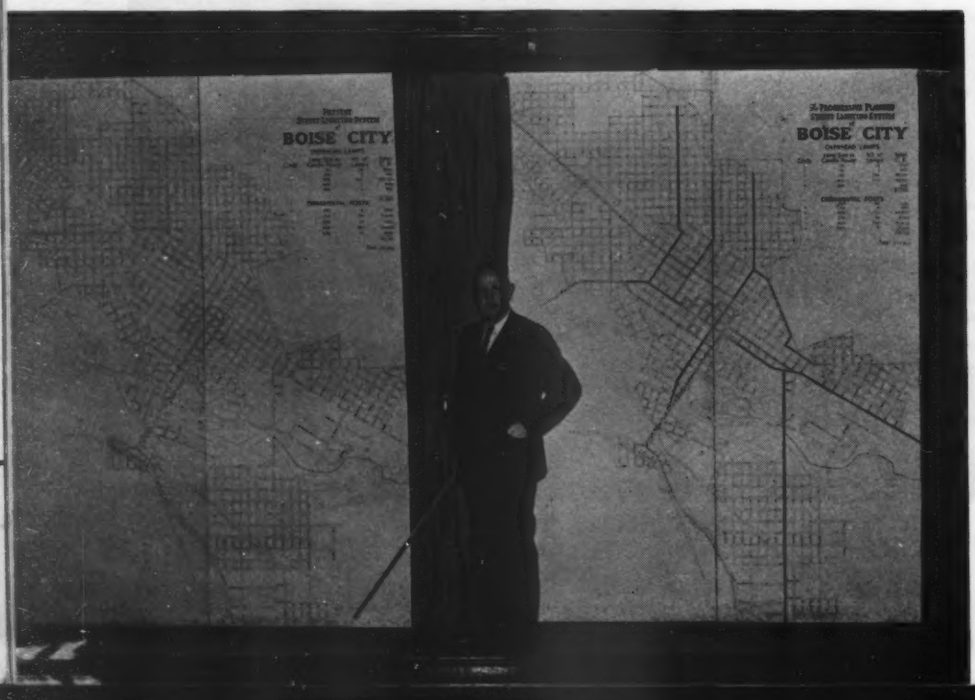
Our company, recognizing the advantages of adequate street illumination and its relation to civic development, made a study of the individual street-lighting needs of each community in the territory, thus providing for each city and town a tailor-made plan based upon its own individual problems and requirements. At the same time a new schedule of street-lighting rates was inaugurated, which was based upon incremental costs and represented a substantial reduction for dusk-to-dawn service.

With this reduction of rates and our knowledge of the desire for more adequate street lighting, a plan was inaugurated that would not only be effective and understandable to civic bodies, but one that would bring immediate results.

Two agencies were decided upon to carry our story to municipal governing bodies, chambers of commerce and other civic organizations. The first was the use of maps. One map was prepared illustrating the present street-lighting system, showing the locations and intensities of present lamps. These maps were pasted on masonite boards and built into boxes about 5x6 ft. by 8 in. deep. Holes were bored at all lamp locations and colored paper pasted on the inside to indicate the candle-power. Light was furnished from lumiline lamps installed inside the box. A similar map, made up to show the proposed lighting system, was designed after careful study of the individual requirements of each town.

*Assistant general manager.

ILLUMINATED before and after maps were used in making a presentation



Illuminated Maps

The two maps were used side by side, making it easy to visualize the proposed changes and improvements. The map showing the existing installations was always lighted first, and the deficiencies of the existing system were explained, so that the advantages of the proposed system became strikingly apparent when the second map was lighted. Embodying both light and color in a partially darkened

room, these maps illustrated effectively the contrast between present facilities and modern, adequate installation. They showed where new circuits should be placed and where lighting levels should be increased.

And they enabled a resident of that particular town to find his own street and block and to see for himself the improvement that was contemplated for his own neighborhood.

At the end of each presentation to a city council the illuminated maps were given to them as permanent fixtures for use in future planning of street illumination. Thus, in months to come, the mayors, councilmen, street committees and citizens will be able to visualize the long-range program of lighting. Yearly improvements will be facilitated by using the maps for reference work.

Increased Business

The second agency which was used to present the case for better street lighting was a series of display cards presenting facts to support our comments on the present and proposed systems. The sales story was dramatized and simplified, avoiding a statistical presentation that might be tiresome to listeners. We found it advisable first to arrange for a preview of our presentation with the mayor, city electrician and chairman of the lighting committee. In almost every case they were enthusiastic for the improvement, and arrangements were then made for a formal presentation of the subject at their regular council meeting.

Street lighting was sold on the basis of its value to the modern community and the economy of using plenty of it.

Value number one is the increased business to be secured from residents and by enlarging the city's trading area. We pointed out that good street lighting attracts tourists, creates customers and advertises the town—just as certainly as good store lighting stops passers-by, invites shoppers and advertises a business. We advised businessmen to light up the business district to the point where it would be a real invitation for folks to go "down town" and for rural residents to "go to town" when the evening chores are done.

During recent years there has been a steady migration westward to Idaho and other Western states. Thousands

[*Continued on page 116*]

Petersen Coil Protection Equals Lightning-Proofing

Analysis based on two-year operating record of Petersen coils on 66-kv. system shows favorably in comparison with alternative lightning protection measures

R. E. NEIDIG,* Metropolitan Edison Company, Reading, Pa.

AN ANALYSIS of operating records of the 66-kv. system of the Metropolitan Edison Company, after two years experience with Petersen coils installed at three locations, revealed some interesting and perhaps valuable results. The data were compiled to compare results obtained with Petersen coil protection with results which might have been attained had other measures of protection been employed on this transmission system.

The methods of protection compared with Petersen coil protection were (a) complete lightning proofing of all 66-kv. transmission lines, *i.e.*, installation of overhead ground wires and counterpoise on approximately 190 pole or tower line miles, and (b) installation of protector tubes on approximately 269 circuit miles.

The following table gives a summary of the analysis:

	Two-Year Total	Per Cent of Total
Faults, total	328	100.0
Faults cleared by Petersen coil, total	204	52.2
Faults preventable by lightning proofing all lines (overhead ground wires and counterpoise)	199*	60.7
Faults preventable by use of protector tubes	195*	59.5
Faults cleared by Petersen coil, due to lightning	124	37.8
Faults cleared by Petersen coil, due to other causes	80	24.4
Faults preventable by combined use of Petersen coils and lightning proofing	278	84.8
Faults not preventable by any of above methods of system protection	50	15.2

*Assuming 100% effectiveness.

The three Petersen coils were placed in service in October, 1937. Their application and design features were described in a recent A.I.E.E. paper by H. M. Rankin and the writer. From the tabulation, it will be noted that of the total of 328 faults 204, or 62.2 per cent, were cleared from the system without system disturbance or circuit breaker operation. Of the 204 faults cleared by the coils 124 occurred during lightning storms and 80 were due to other causes, such as high wind, rain, trees, birds, unknown causes, etc. Included in the total of 328 faults were all types of disturbances involving the 66-kv. system, regardless of whether or not the fault involved ground.

Petersen Coils Advantageous

A total of 199 faults occurred during lightning storms, including 124 cleared by the Petersen coils. In determining the number of faults or system disturbances which would have been prevented if all 66-kv. lines had been completely lightning proofed, it was assumed that 100 per cent protection would be obtained therefrom. On this basis it will be noted that a total of 199 faults, or 60.7 per cent of the total, would have been prevented.

Again assuming 100 per cent effectiveness, it was found that 195 faults would have been cleared without system disturbance had protector tubes been employed. Conclusive evidence of mid-span faults which could not have been eliminated by this method of protection accounts for the lesser number than might have been prevented by complete lightning proofing.

Summarizing, it will be noted that in these first two years of operation with Petersen coil protection the coils were responsible for eliminating a slightly greater number of faults than would have been eliminated by the

[*Continued on page 116*]

*Relay engineer.

Home economists of F.P.&L. Co. hold electric cooking classes for dealers and salesmen for instruction in use of ranges

Ranges and Water Heaters Respond to Heavy Promotion

Six thousand to nine thousand major appliances per year are purchased in the territory of the Florida Power & Light Company due to broad and intensive company promotion

R. B. ROBERTS, JR., Florida Power & Light Company, Miami*

DESPITE an electric range saturation of 22 per cent and an electric water heater saturation of 13.1 per cent at the beginning of 1939 customers of Florida Power & Light Company during the ensuing twelve months bought from dealers 6,238 electric ranges and 2,530 electric water heaters, more than ever before.

Due to the all-service aspects of the company's sales policy, the cost of range and water heater promotion is not segregated. However, the overall cost of sales and promotion of all services by the company approximates 50 cents per dollar of estimated annual revenues.

The company firmly believes that the best way to sell appliances is to sell the advantages of use of them. And the best way to sell the *use* is to sell the *Servant* (the company) and the *Service* it renders along with it. To sum up, success of range and water heater sales in Florida Power & Light Company territory is attributed principally to:

Selling "all three."
Emphasizing the cheapness of electricity.
A sound dealer sales development policy.
Selective all-service selling.
Selling the use of Florida Power & Light Company's electric service as a means of enjoying the use of electrical appliances.
Close co-ordination of all sales personnel.
A good market.
A well-rounded advertising and sales promotion program.

Sell All Three

The 1939 sales program, "To Sell Well—Sell All Three" clearly proved the necessity for and advantages of selling "all three"—(1) The *Servant*, (2) the *Service* and (3) the *Use*—on every sales interview. Stressed on every page of this program was the fact that electricity was cheap.

Check sheets detailing the salable advantages of each of the "three" provided a definite means for planned all-service sales interviews.

Campaign schedules were included and point credits assigned for each use of service in order selectively to stimulate and direct individual and mass effort toward the sale of those uses most beneficial to the customer and to the company.

Every salesman was assigned a point quota to reach and given the following five monthly sales duties to perform before being eligible for prizes: (1) Make at least 200 planned all-service sales interviews per month; (2) prepare complete customer record sheets on 150 of his calls listing customer's kilowatt-hour use, appliances owned, condition of appliances and all pertinent information necessary for subsequent planned interviews and selective selling; (3) present 25 "Thrifty Three" plans, small visualizers of all services which include a *written* value comparison analysis of the service that the customer has been interested in; (4) make 25 demonstrations in the home of some use of a service most needed

* General sales manager.

by the customer, and (5) sell additional use of service to five low-use customers.

While all of these duties are obviously promotional in so far as merchandising appliances is concerned, they directly merchandise electric service.

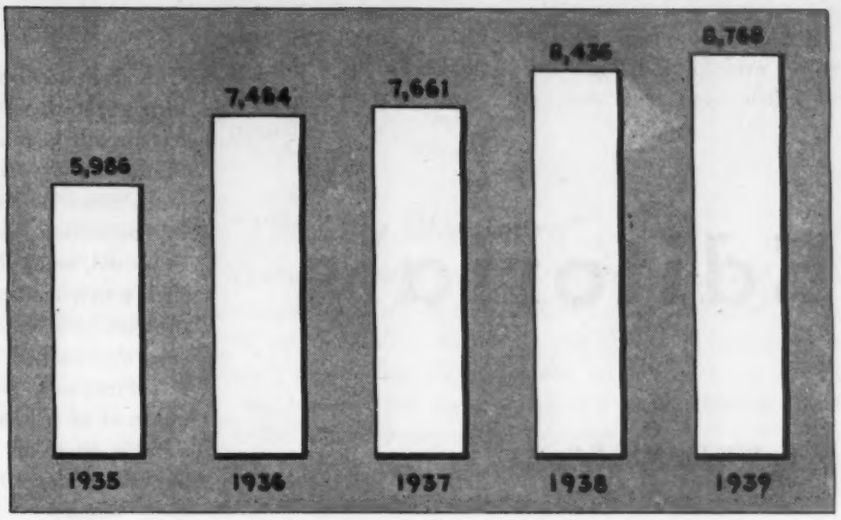
If the salesman could not close the sale on the first call or two, but the customer showed interest in some particular use of service, he made out a lead which listed the use interested in, the competitive service used, the cost of operation, condition of equipment and the amount of the present monthly electric bill. This lead was turned over to a dealer.

All salesmen, in addition to their regular handbooks listing complete information about the uses of the services they sell, carry a testimonial book. This book was prepared from testimonials secured in all districts served by the company. Each testimonial is on a separate page, which shows a picture of the writer in her kitchen or her home, lists the appliances used, the number in the family and the average amount of the service bill.

Salesmen are also equipped to render a kitchen-planning service. Arrangements were made with an architect in Miami to draw model kitchen plans from information submitted by salesmen on special jobs.

All-round Training

All salesmen for the past few years have attended scheduled sales training courses. The original course covered "how to sell" in general. Each subsequent series was narrowed down more and more to selling utility services, until at present salesmen are selling mythical Mrs. Browns the use of cooking and water heating after first having to overcome a stipulated "servant" or "service" objection or sales resistor.



Annual sales of electric ranges and water heaters by Florida Power & Light

Home economists take these same training courses and promote the use of company service by conducting scheduled demonstrations in the company's home service kitchens, located in fourteen district offices; by making other mass demonstrations, and by calling on individuals who have just purchased ranges.

Home economists by appointment also conduct demonstrations on dealer sales floors for groups of prospects and instruct dealer salesmen in the proper use of electric service. A weekly class is held in the company's Miami "Sunshine Service" kitchen for dealer salesmen, who don uniforms and participate in the actual preparation of meals. While the meal is being prepared the home economist demonstrates and explains the various uses of service employed and by checking the actual cost after the operations graphically illustrates the fact that "electricity is cheap."

Twice a week over a Miami radio station a home economist broadcasts the "Sunshine Service Kitchen of the Air," giving recipes, helpful hints to housewives and advertising the advantages and cheapness of using Florida Power & Light Company's electric service. Favorite recipes are solicited from her radio audience and a weekly prize is given for the best recipe.

In some rapidly expanding territories served by the company it was found advisable to employ new construction representatives—salesmen whose primary job it is to see that all new houses are wired for complete electric service and that the contractor, owner and all interested parties are sold on the advantages and cheapness of the company's service.

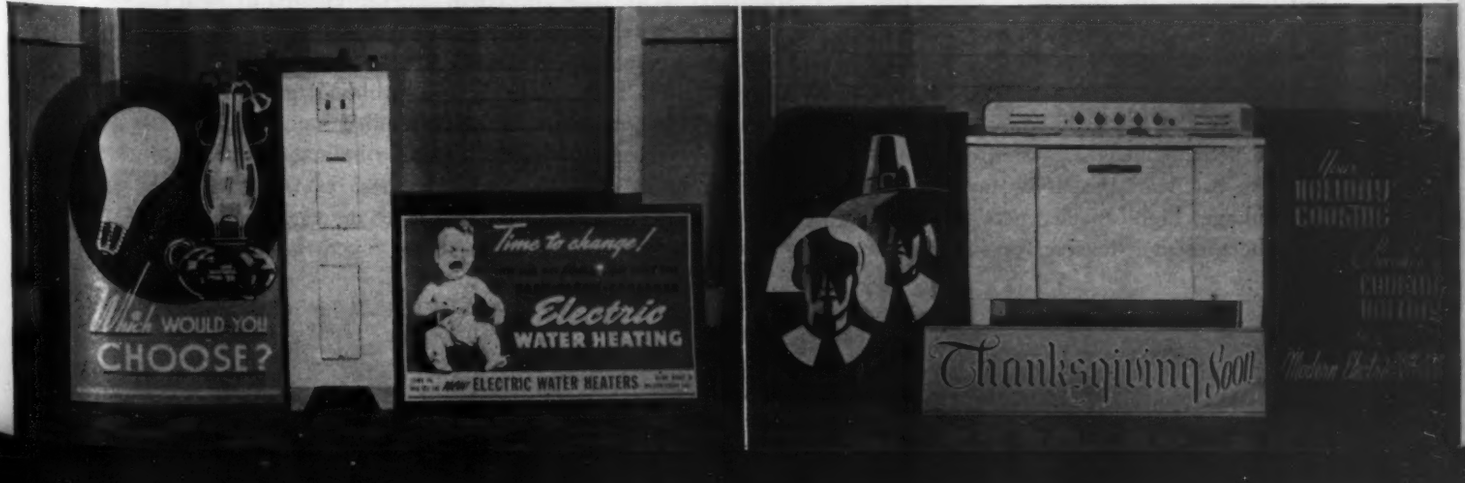
Dealer Program

Since about 96% of all uses sold in company territory is now sold through dealers, particular attention is given to these sales allies.

A special 1939 dealer sales program was prepared and presented to all dealers. It emphasized the advisability of selling "all three" and the constantly decreasing percentage of total company and dealer sales sold by the Florida Power & Light

[*Continued on page 114*]

Two examples of simple standardized window displays used in 30 company stores, and changed weekly



Editorials

S. B. WILLIAMS, *Editor*

Common Stock Can Again Be Sold

THE PUBLIC will buy new common stock of utilities. This was amply demonstrated last week in the sale of 160,000 shares of West Penn Electric. Several large blocks were taken by institutions, but there were hundreds of sales in small lots to individuals. Moreover, the stock found a market everywhere it was offered from the Atlantic to the Pacific.

This was the first large issue of entirely new equity money to be floated by an electric utility in a great many years and its acceptance by investors is sufficient evidence that stock issues of operating properties will find a ready market.

It has been a common complaint of the industry that expansion could not go ahead faster because of inability to float a balancing amount of equities. With bond yields down to the lowest level in history and the public quickly buying common stock there is now no financial hurdle to a faster construction program.

The credit of the industry, never seriously hurt, has now been restored.

Grid Too Complicated to Be Hurriedly Erected

THOSE who have followed the various phases in the progression of the National Power Grid idea, starting with 1933 and following through with the statement of the government view at the time of the 1936 World Power Conference, could foresee the present proposals some time ago. The thing that is alarming, however, is the hurried action that is suggested or even contemplated.

The problems posed by any suggestion for a new high-voltage, high-capacity network to be superimposed over the present extensive transmission networks in the United States are not the same as are brought about in a situation where a copy or an extrapolation of what has already been accomplished can be carried out. Because of this superposition, the questions that are raised are much more difficult and much more involved than those in connection with the British grid when it was first proposed, some decade and a half ago. Co-ordination of such a new transmission system with the existing systems presents problems that in scope and complexity are not even approached when a system can be planned *de novo*.

Foremost among the problems presented is the question of workability. It is not safe to assume that any scheme such as the one contemplated, and connected now or in the very near future to systems with a generating capacity of approximately 20,000,000 kw., will work simply because high-tension transmission lines have operated successfully. Neither one line nor two lines constitutes a transmission system. Nor can performance of such substantially isolated lines be used as a criterion by which to judge successful operation of a network as extensive and as involved as the one recently proposed.

In attempting to study the workability of a system of this type, one almost immediately runs into major difficulties. For example, it is necessary almost at once to solve the problem of entrances and exits into the various points at which the new transmission network will connect with existing systems. This is essential because the transformer connections, the switching arrangements, the condenser installations and a good deal of the other regulating equipment will be determined to a considerable extent by the location of the connection points of the various power groups to any contemplated grid of the kind under discussion. And it is not safe, certainly in congested centers, to assume connections unless and until the problem of ingress and egress of the very high-tension circuits, including the problem of ingress and egress of the additional connecting lines, has been studied and a solution found that is within economic limits.

Another important problem is the question of costs. Granting that line costs are more or less fixed and for a preliminary study at any rate can be estimated with close enough accuracy upon a basis of general experience, the cost of entrances has to be studied for each specific location. It is not out of the question for the unit costs of entrances to be from five to 25 times the average cost of the transmission lines over cross-country territory. Where entrance conditions prevail for an appreciable portion of the distance surrounding a community it is apparent that the cost of entrances alone, minor as may be the total mileage of line represented by such entrances, may have a major influence on the cost of the total project.

Then there is the problem presented by system changes. These must be studied not only from the angle of what changes will have to be made in order to accomplish what the broad purpose of the grid is, but also from the angle of the effect on various portions of the system naturally affected by one or more ties between any

one particular system and the grid system as a whole. Both of these problems involve major studies of the utmost difficulty and complexity.

One of the admitted economic assets of a grid system of the type discussed is the resulting generating capacity saved, due both to diversity and to reduction of spinning and cold reserve. The question of diversity, however, is a most involved one at its simplest, and becomes even more involved when it has to be considered from the standpoint of having the diversity gathered as a result of integration of the diversity of many systems separated by hundreds of miles, made available to one system that may be located at the very edge of the grid.

Difficult as is the problem of diversity, the problem of reserve is admittedly even more so. The question of how much reserve can be saved and the minimum safe value that each section of the grid or each system connected to the grid can be brought down to, is one involving not only many detail studies of local loads and the characteristics of the local systems, but one in which major consideration has to be given to the detailed programs for scheduled maintenance and overhauling of turbines and boilers, to the facilities that are available for that work, and to the time factors involved if such overhauling is to be carried out on an economical basis. This again calls for the kind of study that cannot be rushed and that needs a great deal of work and patience.

Another economic asset, and an admitted one, that would be obtained through a National Power Grid would be generation economies made possible through the use of the more efficient plants at greater load factor and these plants located more strategically with regard to fuel resources. However, no study based, for example, on a mass time-duration curve can possibly give a result that can be relied upon with any degree of accuracy, and any result based upon rough approximations of that kind may be in error by several hundred per cent. In short, even an evalution of the economies resulting from the working out of such a simple concept as greater use of the more efficient plants is one that is highly involved and needs detailed study.

Additional generating capacity and large quantities of generating capacity are well under way in practically every power center of the United States, so that the possibilities of a material power shortage over the next few years seems rather remote. Yet this does not justify any delay of the grid project, if it is sound. It would be folly, and partisanly selfish, for the utilities not to press forward with all reasonable dispatch a study of the proposals made by government power officials and other governmental representatives interested in various phases of a National Power Grid.

But a still greater calamity would result if the country embarked on the development of a grid on a rush basis and if it undertook the development of any scheme hurriedly conceived, improperly studied and hastily erected. Neither the utilities nor the country as a whole can afford that kind of action, regardless of how or by what groups the funds for such a scheme would be furnished.

"The City We Serve"

CLOSE IDENTIFICATION with local interests of the community it serves is a condition most profitable in public relations terms to the electric utility. Achievement of such recognition in the minds of customers is a long step toward that ideal of friendly public feeling which is the aim of every utility company.

If its annual report for 1939 may be taken as representative of all the efforts of New Orleans Public Service, Inc., in this direction, then it may be said that this utility is making an excellent start on that long road. Although it is amply informative of the condition and of the operations of the utility, the report leaves the reader with the distinct impression that New Orleans is a mighty fine place in which to live, to work and to do business. One has the feeling, after looking at the report, that New Orleans Public Service, Inc., is pretty proud of its position as servant to such a grand city.

This result is accomplished, not by any heavily elaborate and expensive presentation of the report, but quite simply and in good taste. There is in it no suspicion of "forcing," no building up of the local patriotism theme to the point of making people say, like Hamlet, "The lady doth protest too much, methinks." Instead, it appears simply that the company is stating the fact of its integration with the community and is glad of the chance to do so.

The specific ways in which this effect is achieved in the report are really quite few and very uncomplicated. First of these simple ways is the notation on the page listing officers and directors that all of these are New Orleans men and that the transfer agent and registrar are New Orleans banks. The text of the report begins with a brief historical note on "The City We Serve," and then goes on to discuss local business conditions and civic improvements, leading into an account of the company's operations. The statistics of sales, revenues, taxes, value of plant and operating conditions are presented graphically as well as in figures, so that a quick picture may be obtained. In a pictorial map on the front cover the utility system is shown in relation to the resources of the area. The back cover is frankly a boost for the city showing its history, romance, glamor and modern progress. On the inside covers are photomontages; in front the plants and structures of the utility and in back the diversions, the outdoor sports and the shows offered by the city.

Altogether the report emphasizes that New Orleans Public Service is not only *in* New Orleans, but is definitely and integrally *of* New Orleans. When that idea is fully accepted by the people it serves the utility will have come close to the solution of the public relations problem.

Willkie's Candidacy

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

WHENEVER a group of business men—especially the upper bracket boys—gather, these days, whether at the nineteenth hole, at a board meeting, or wherenot, if the conversation turns to politics some one will say: "I wish they would nominate that fellow Wendell Willkie for President. I would like to see him in the White House."

The statement always arouses interest, seldom encounters dissent, but the resulting conversation finally reaches the regretful conclusion, concurred in sometimes by a majority and sometimes by all: "But of course it's out of the question. He couldn't be elected. He would be crucified because he's a utility man."

Occasionally the argument takes a philosophical turn, reaching the further conclusion that it would be a bad thing for Willkie to be nominated, because the electrical industry has been a football in politics too long already. It would be too bad, they agree, to make it the "paramount issue" in the campaign about to start.

Every reader of ELECTRICAL WORLD has probably run into such conversations more than once in the last month or so, though frequently he may have been the only man in the group personally interested in the electrical industry.

Easy Picking?

Yet how seldom, in such conversations, is it observed that from a political standpoint the electrical industry is easy picking for any demagogue who can't think of a better issue; that it is likely to stay in this vulnerable position for this presidential campaign at least, and perhaps a good deal longer. The "capitalistic" conversations seldom get this far, and virtually never reach the ultimate point, which is that it is very difficult to imagine any new type of attack on the electrical industry.

To be accurate, neither is there any new defense which can be made for the electrical industry. It is very much a twice-told tale on both sides. But there is this very important point—the public has been barraged much more intensively with the arguments against private ownership of the electrical industry than it has for private ownership.

Which brings up the point—why is Wendell Willkie singled out in so many of these conversations as a man the business men would like to see in the White House, but——?

Isn't the real reason that Willkie, because of his controversy with the TVA, took his battle to the public and on several occasions embarrassed the New Dealers almost to the point of speechlessness? Remember the advertisement—after the deal was made—telling the local Tennessee communities how much they would lose in taxes? Remember how much trouble there has been about that since?

Why, right now, the Tennessee communities are seething because it doesn't look as though they were going to be compensated, right away, for this loss of taxes. That's another story, but what is happening is that some of the House leaders are purposely holding off action because they are tired of Senate conferees who will agree to nothing George Norris doesn't approve.

Getting back to Mr. Willkie, there is no intention here to boom him for the nomination. In the first place, he's not a candidate. Willkie laughs about it. This writer has been talking to men who hoped to be President, including all who became President, for a good many years. None of them laughed about it. Even the jovial Warren Harding became awfully serious when he talked about that. In fact, George Moses once laid down the rule that the way to succeed in politics is to be a "solemn ass." He broke his own rule and look what happened to him!

But there are certainly possibilities in the thought of private versus public ownership debates in this coming campaign, with both sides capably presented. This may seem a jarring thought to many utility officials. They know exactly the sort of brickbats with which they and their companies would be assailed by the opposition. And they think of them as brickbats, not as shells which have already exploded, or duds which never did and never will.

Believe it or not, the left wingers would not like to see that the paramount issue of the campaign. They know, for example, that up to now only one state of the 48 has been really aroused over this matter of the loss of taxes when public ownership moves in. That is Tennessee. They do not want that picture held up too clearly before the taxpayers of the other 47 states.

Public Ownership Issue

Well, neither the left wingers nor the utility executives need worry overmuch about public ownership being the paramount issue in this campaign. It is becoming clearer every day that foreign affairs are apt to preempt that particular spot.

Assuming that to be true, wouldn't it be helpful if there could be a few local elections, in districts and states, with public ownership the chief issue in the battle for Senate and House seats? Remember the 1930 primaries and elections? They pointed the way to the most remarkable political reversal this country ever saw—that on prohibition. After the 1928 avalanche only a few hardy souls thought they would ever see legal liquor in the United States again. The wets had reached an ebb far below anything the anti-government-competition-with-private-business element has ever touched.

Maybe sentiment for private initiative can be revived in this country!

NEWS OF THE WEEK

Utilities Seek Extension to File Integration Plans

Find it difficult to meet deadline in answer to SEC show cause orders— U. G. I. declares system is integrated and conforms to act — Commonwealth & Southern gets extension — North American asks more time

Electric utility holding companies are finding it difficult to meet the deadline to answer the show cause orders of SEC for filing of system integration plans. Some of the larger systems have asked, and received, an extension of time for filing answers. SEC is taking a critical point of view on the plans and, while moving cautiously, is determined to proceed with public hearings.

Grants Intervention

SEC has permitted the Wisconsin Public Service Commission to intervene in the integration proceedings of Electric Bond & Share, Middle West Corp., Standard Power & Light, North American Co. and United Light & Power. The Pennsylvania commission was allowed to intervene in the Electric Bond & Share and Standard Gas proceedings.

An application for intervention by the city of Las Animas, Colo., in the Engineers Public Service proceedings indicated that various municipalities might attempt to take advantage of the integration program to acquire utilities serving the community.

United Gas Improvement Co. told the SEC, in its answer to the show cause notice, that "a proper and complete examination of U.G.I. and its subsidiary companies, the relationship among said companies, the character of the interests thereof and the properties owned or controlled thereby, if made by the commission as required under the provisions of the act, will show that the companies, interests and properties conform with the applicable provisions of the act, construed within constitutional limitations, and with the law of the land."

The company's answer further stated that "the alleged holding company abuses recited in Section 1 of the act have no significance with respect to U.G.I., except to mark U.G.I. as excluded from such indictment and its consequences."

"The well-recognized financial integrity of U.G.I. and the related operating companies, and eminent ability of U.G.I. to go forward in the regional area in which its investments are concentrated, in co-operation with localized management and state and federal regulatory bodies within their respective jurisdictions, stand out as unimpeachable evidence of its sound position in the utility industry."

U.G.I. asserted that it proposes to sell for cash its remaining isolated utility interests in Arizona, Tennessee and New Hampshire, or exchange them for other and contiguous utility properties.

SEC Order Defective

There was evidence in the answer that the company believes its system to be integrated and that the constitutionality of the utility act is much in doubt. It was further contended that the SEC order was "defective" in many respects.

Standard Gas & Electric Co. advised the SEC of plans already worked out for "partial compliance" with the act, saying that it was working on a plan for disposal of the securities owned by it in companies constituting the western properties. These are the San Diego Consolidated Gas & Electric Co., California-Oregon Power Co. and Mountain States Power Co. The divestment would be accomplished by an exchange offer for Standard Gas debentures at terms to be announced later.

Standard Gas asked for a 60-day extension for the filing of an over-all program of compliance with the integration provisions of the act "to the end that the company may submit to the commmission proposal which will be fair and equitable and will be appropriate in the public interest and for the protection of investors and consumers. SEC granted the delay in filing.

This week Commonwealth & Southern Corp. was granted a two weeks delay in filing its answer. The SEC refused to postpone from April 26 its hearings on integration of Engineers Public Service. The company had asked a 90-day extension.

North American Co. advised the commission that it is formulating a statement of the program to be included in its answer and asked the SEC for a 30-day extension in order to complete its answer. The statement is to involve serious questions of policy as well as many legal and practical considerations.

•

SEC Called "OGPU" in Inquiry of Utility

The New Deal was charged this week with attempting to "smear" public utilities and Senator George of Georgia in the present investigation of alleged political activities of Georgia Power Co. by its president, Preston S. Arkwright. Senator George defeated the New Deal candidate, Lawrence Camp, now Federal District Attorney in Atlanta, in the "purge primary" of 1938.

Mr. Arkwright charged that the SEC

has sent detectives and spies into Georgia for an "inquisition" and was using "the methods of the OGPU and Gestapo" in seeking information against the company. SEC admitted this week that the investigation was being made on the basis of a complaint it had received several months ago. However, the SEC said that the complaint made no charge against Wendell L. Willkie, president of Commonwealth & Southern.

Both Mr. Willkie and Mr. Arkwright denied that there had been any political activity by the utility or its officers or subsidiaries.

"When the SEC inquiry, made on complaint of a disappointed office seeker, first started I personally ordered a separate investigation to determine if there was any truth in the charges," Mr. Willkie said. He said that he was convinced that "there is not a word of truth in the charges."

Mr. Arkwright was vitriolic in his denunciation of the New Deal methods in the attempt to "smear" Senator George and carry out its "pet hate" against the utilities. He called the inquiry an "underhanded" method to kill "two birds with one stone."

•

City of Pittsburgh Joins Duquesne Rate Battle

The city of Pittsburgh, by resolution of Council, has joined the Pennsylvania Public Ownership League in a request for rehearing and amendment of an order made by the Public Utility Commission on March 19 on the Duquesne Light Co., according to a statement issued at Harrisburg, Pa., by the Pennsylvania Public Ownership League.

Instead of a voluntary rate reduction of $1,724,000 by Duquesne Light Co., as accepted by the commission in its order, the Public Ownership League and the municipality of Pittsburgh claim a further rate reduction of $4,245,846 as well as refunds amounting to $15,300,497, which, it is contended, represents excess revenues collected from the consumers.

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Appliance Sales

Dealer sales in the territory of Virginia Public Service in March were 30 per cent ahead of least year. Sales included 108 electric ranges, 977 refrigerators, 44 water heaters and 429 miscellaneous appliances. For the first three months sales totaled 228 electric ranges, 1,682 refrigerators, 65 water heaters and 1,053 miscellaneous appliances. Dollar volume of sales in March was $207,077.

Set Demands on TVA Tax Replacements

Anti-TVA members of the House military affairs committee, led by Representative Charles I. Faddis (Dem., Pa.) have warned TVA supporters on the committee that unless they agree to abide by two conditions no TVA tax replacement bill will be reported out this session of Congress.

They demand (1) that any replacement program must be accompanied by a mandatory increase in TVA power rates and (2) that pro-TVA members of the committee must bind themselves to defend the committee bill on the floor and in conference, regardless whether they agree with all provisions of the committee measure.

Chairman Andrew Jackson May (D., Ky.) disclaimed participation in the Faddis move, but stated that in his opinion it hurt chances of obtaining tax replacement at this session. Mr. Faddis said he speaks for three other Democrats, who, with Republican support, control the full committee.

A tax replacement bill authored by Senator George W. Norris and Representative John J. Sparkman (D., Ala.) has been referred to the military affairs special TVA subcommittee, also chairmaned by Mr. May. In the Senate the Norris-Sparkman measure is on the Senate calendar awaiting action by the House.

•

FPC Opposes SEC Move on Merger of Utility Units

Attorneys for the Federal Power Commission have raised objections with the SEC on the proceedings which it is now conducting relative to the proposed merger of three subsidiaries of United Light & Power Co. under the utility act.

The FPC expressed the opinion that the SEC ought not to pass on the merger on the grounds that its own proceedings may be affected by the consolidation. The FPC has pending before it a rate case affecting one of the subsidiaries of United Light & Power. It is feared that the merger would consolidate certain records and prevent an analysis of cost allocation.

•

Robertson Urges Americans Face Problems as Citizens

The time has come when Americans must face problems as citizens of their whole country and not as members of minority groups, Andrew W. Robertson, chairman of Westinghouse Electric & Manufacturing Co., declared in a guest editorial in the current issue of *Profit and Progress*, publication of the National Association of Insurance Agents.

Mr. Robertson declared that "an analysis of most of our unrest will disclose that it springs from minority pressure groups who desire some advantage for themselves, which advantage must be paid for by the rest of the world." He stated that "the foolish schemes which we have listened to are all brain children of minorities."

•

Trustees Report on Associated Gas

Operating properties of the Associated Gas & Electric system will spend between $24,000,000 and $30,000,000 for new construction in 1940, Walter H. Pollak, trustee for Associated Gas & Electric Co., and Denis J. Driscoll and Willard L. Thorp, trustees for Associated Gas & Electric Corp., told Federal District Judge Vincent L. Leibell of New York in their first report to the court. The trustees were appointed March 1.

In regard to steps taken toward the integration of the system, the trustees reported that there are seven situations where options have been given for sale of properties, all entered into prior to the receivership and involving an approximate aggregate sale price of $13,250,000. These options did not include $1,560,000 received from the sale of Sioux Falls Gas Co., which money will be used either to retire Associated Electric Co. debentures or for additions to capacity of power plants of the Pennsylvania Edison Co.

In reference to the problem of complying with the integration requirements of the Public Utility Act, Dr. Thorp said that the trustees did not now know what steps would be taken to conform with the requirements.

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Approves Utility Sale

Sales of the Hobart (Ind.) Light & Water Co. to the Northern Indiana Public Service Co. has been approved by the Public Service Commission. The $500,000 sale price includes all property, which has 1,065 water and 2,009 electric customers.

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Will Add 1,000-Kw. Unit

Board of Public Affairs at Wellington, Ohio, will spend $75,000 for a new 1,000-kw. turbo-generator for the municipal light plant.

Federal Power Projects Present Major Problem

Utilities in Northwest indicate willingness to assist in marketing power — Northwest Electric Light and Power Association meeting told that government ownership kills incentive to ingenuity

One effect of depression is a vast program of federal power plants, J.E.E. Royer, Washington Water Power Co. and president of the Northwest Electric Light and Power Association, told 175 engineering members at their annual meeting in Spokane last week.

Mr. Royer said that this power is a challenge in the sense that "we must accept the responsibility of co-operating in efforts to secure full utilization of that power. Private utilities have indicated their willingness to assist in marketing."

Free Enterprise

It was pointed out by Mr. Royer that "public ownership—political operation—gives no encouragement to invention, no incentive to ingenuity. The government cannot by edict create an Edison or a Steinmetz. Genius is nutured by private enterprise. Every engineer—every citizen—has a stake in free enterprise in this country."

Paul P. Ashworth, Telluride Power Co., section chairman, presided at the three-day session of discussions of how the group's technical work bears on the situation which faces electric utilities in the Northwest. The thirty-three technical papers on engineering and operating problems indicated the ingenuity at work.

Of special interest in the West, where hydro predominates, was the report of A. P. Newberry, Puget Sound Power & Light, on welding waterwheels. He described new techniques of metal spraying, using propane flame, and emphasized the advantages of carrying on the work at low temperature.

The accident prevention group reported that while vehicle-miles increased, accidents decreased. This was the group's first real study of the performance of vehicle drivers. Accidents relating to personal injury on the job likewise showed improvement, in regard to both frequency and severity.

A report on appliance efficiencies in the Northwest, presented for Corbett McLean, Northwestern Electric, indicated that loss in revenue by reason of better efficiency is serious, and the report urged the necessity of improving versatility and developing new applications.

Among subjects of more recent interest in the Northwest were reports on applications of portable substations by D. C. Keller, Puget Sound Power & Light, and on reinforcing older rural lines by J. F. Emery, Idaho Power.

Present at the meeting was the display of new standard distribution transformers, which was escorted west by Merrill DeMerit, West Penn Power, representing E.E.I., and Col. A. E. Herzberg, Wagner Electric, representing N.E.M.A. A. B. Campbell, E.E.I., summarized progress on codes.

A feature of the meeting was the showing of Washington Water Power's exceptionally good motion picture, produced by E. J. Crosby, a picture which dramatizes electric service.

Many delegates visited Grand Coulee Dam, nearing the final stages of concrete pouring and soon to be ready to dump its generating resources into an already well-served market.

•

EHFA Will Finance Air Unit Credit Plan

Retail sales of self-contained, one-room air-conditioning equipment will be financed by the Electric Home and Farm Authority, an adjunct of the RFC, according to its president, Emil Schram. A 5 per cent down payment will be required and the balance may be paid over three years, or, if the equipment is a part of other large purchases of electric supplies, four years. Retail sales will be financed by EHFA when made through an approved dealer in a territory served by a utility company which has an agreement with EHFA providing for collection of installment payments.

•

Offers Bonus Plan

Commonwealth Edison Co. is offering a bonus plan for dealer electric range salesmen during the period April 1 to June 30. A bonus of $5 will be paid on each approved electric range sold.

NORTHWEST MEETING—Right—(l. to r.) Malcolm Cundall, Wagner Electric; Charlie Cutter, Pacific Electric Manufacturing Corp.; J. E. E. Royer, Washington Water Power. Bottom—(l. to r.) A. B. Campbell, E.E.I.; Merrill DeMerit, West Penn Power; Paul Ashworth, Telluride Power, and Pat Murphy, G. E.; Clint Hurd, Allis-Chalmers; Col. A. E. Herzberg, Wagner Electric

Power Economy Stressed at Meeting in Chicago

Diversified program of Midwest Power Conference draws 500 attendance — Leaders point to social obligations of engineers — Hydro-power projects discussed at session

An attendance of about 500 at the Midwest Power Conference in Chicago last week attested to the interest in a series of papers on power topics. Economics, trends, new equipment and practice were discussed.

One of the new things was a Diesel engine that burns either gas or oil with equal facility. H. W. Dow says the unit in 1,000-kw. size operates at 10,400 B.t.u. per kilowatt hour at full load. It is particularly advantageous where gas supply is intermittent. The operation is on a Diesel cycle with either gas or fuel oil.

Gas Turbine

P. R. Sidler discussed the gas turbine, of which twelve are now in operation in this country in the Houdry refining process. A power type of turbine of 10,000 kw. can now be built to give about 21 per cent thermal efficiency and, if materials may be found to withstand higher temperatures than 1,000 deg. F., the gas turbine efficiency may be increased.

Philip Sporn pointed out that carrier relaying and high-speed breakers now permit a line to be opened, cleared and closed in from 18 to 20 cycles. This speed is so great that little or no system disturbances or outages occur. He also pointed out that carrier readings could be used to detect sleet on a line which then could be cleared by heating it with one end short circuited. In his opinion, developments will occur to make possible even quicker clearance of faults, and the immediate need is for faster breakers. These new developments eliminate the need for duplicate lines to give service and remove chances of shocks to transmission systems.

The dispatching and allocation of load to a large metropolitan system was discussed by P. B. Juhnke. Weather conditions are noted and load forecasts are made twice a day. A totalizing meter at each station permits of load allocation, and frequency control instruments aid in carrying the load and controlling voltage. The development of present instruments makes the dispatching job easier, but there is still more instrumentation desired to improve the situation.

Power Supply

Power in industries such as paper mills, steel and refineries was discussed in three papers. P. W. Swain pointed out that it is often overlooked that even today steam requirements in industry processes are a larger item than the requirements for power, and neglect of this fact leads to many erroneous conclusions about industrial power supply. L. W. W. Morrow pointed out the trend in power supply to relatively large local power units, the area type of power supply and the portable power unit, such as the Diesel and internal combustion engine. The principle of generation at the load was advocated and nothing on the horizon seemed to threaten the continued use of the steam turbo-generator as the major source of area power in electrical form.

F. M. Farmer and J. W. Parker, at the banquet, stressed the necessity for engineers to take and keep a professional point of view in their work and pointed out the social and economic responsibilities of engineers under modern conditions. Mr. Parker said they should be interpreters of science to the public as well as users of the products of science.

A session on hydro power discussed the Santee-Cooper project, the use of diversified hydro and steam plants in Wisconsin and the factors that need consideration in the design of dams. Another session discussed the technique of operating steam plants with coal, oil or gas or their combinations and P. A. Moe showed the methods and records used to keep up the efficiency of a 4,000-hp. industrial plant to more than 86 per cent over a ten-year period. J. M. Drabelle told how motion picture studies of boiler furnaces gave indications that lead to more efficient operation.

Attractions in lighter vein at the conference were a dinner, a smoker and an inspection trip to the plant of the Electromotive Corporation. All congratulated Prof. S. E. Winston for his splendid management of the meeting.

MIDWEST POWER CONFERENCE—At the speakers' table were (l. to r.) F. M. Farmer, president of A.I.E.E.; Alex Bailey, Commonwealth Edison, toastmaster; and J. W. Parker, Detroit Edison

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To Build New Line

San Diego Consolidated Gas & Electric Co. will build a 105-mile high-tension transmission line to connect with the lines of Southern California Edison Co. on the north side of the San Diego River. The new line, with a new substation at the connection point, will cost approximately $1,159,700 and, it is estimated, will take care of the company's growth in business for two or three years.

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Navy to Buy Facilities

The Senate passed a bill last week authorizing the Secretary of the Navy to purchase from Jersey Central Power & Light Co. the transmission line, substation and other equipment now located at Lakehurst, N. J., at a cost not to exceed $33,204. The equipment was installed originally at the request of the Navy in the naval station at Lakehurst.

Wilson Sounds Note on Trade Optimism

A highly optimistic note was sounded last week by Charles E. Wilson, president of General Electric Co., when he visited Boston to celebrate a gathering of the Charles B. Davis Quarter Century Club of the local office. Mr. Wilson said that the company's backlog of orders is the largest in its history and that in the production of household appliances, industrial apparatus and central station equipment the outlook is extremely encouraging.

Opinion was expressed by Mr. Wilson that the presidential campaign is unlikely to impede materially the growth of business in the United States. It is estimated that not over 15 per cent of the company's total business can properly be classed as direct war orders, although the stimulation of business in plants of many of its customers is influential in the current total volume.

President Wilson cited the rapid development of the household appliance market, still far from saturation, as an instance of the vitality of the electrical industry. All-electric home unit sales are gaining very rapidly, he said, and the 1940 business in such equipment for the first quarter has run 100 per cent ahead of 1939.

In New England General Electric has gained ground for some time. Employment and payrolls are higher than a year ago. Operations are now back to the 1937 peak and the total plant investment in New England aggregates $65,000,000.

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ON PLANT TOUR—President Charles E. Wilson of General Electric discusses plant operations and business prospects with regional officials on his visit to the Boston office last week. L. to r.—Mr. Wilson, A. W. Quennell, president of the C. B. Davis Quarter Century Club; T. S. Knight, commercial vice-president, and R. W. Adams, central station manager for New England district

USHA Wiring Costs Total $24,000,000

One problem now facing the USHA is how to hold down wiring costs while meeting every possible subsistance demand by low-income tenants. The authority has had some difficulty in meeting requirements of the electrical code, particularly Rule 2110, requiring one receptacle, or outlet, for every 10 ft. of wall space.

Due to the fact that size of rooms in most housing projects are no larger than 10 x 10 ft., USHA has recommended to local housing authorities that no more than two receptacles be used. One is an ordinary wall plug, while the other is a combination receptacle and wall light, designed by the USHA. Of course there are other combination fixtures on the market, but the USHA fixture consists of a porcelain base, with the wall light operated by a pull chain. The receptacle is beneath the light.

The USHA is recommending this wall light or a similar fixture in place of a ceiling light.

A. C. Bredahl, chief engineer of USHA, says cost of wiring runs around $150 per dwelling unit, or approximately $37 per room. With 160,000 dwelling units under construction by local housing authorities all over the country, cost of wiring will total $24,000,000, Mr. Bredahl said.

In furnishing power to its group housing projects the project buys its current through a master meter in order to obtain rates as low as possible. USHA officials say this saves utilities the expense of reading meters and collecting bills from individual tenants. From the master meter distribution lines are built to the units.

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Diversion Rights Given to Niagara Falls Power

New York Supreme Court Justice George A. Larkin granted this week to the Niagara Falls Power Co. the right to divert 20,000 cu.ft. of water a second at Niagara Falls for power purposes.

Justice Larkin's order allows the company to divert 15,100 cu.ft. of water a second without paying the state a rental charge. On the balance of 4,900 cu.ft. of water the company has to pay the state an annual rental of approximately $400,000.

The state Water Power and Control Commission brought action on the ground that the company had no right to divert 15,100 cu.ft. of water without receiving from the commission a license under which rental for use of such waters would be imposed.

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Liversidge Sees Uptrend; Bryans Named Director

Although combined sales of power by the Philadelphia Electric Co. for the first quarter of this year were ahead of a year ago, the trend has been downward since the peak was reached last fall, H. P. Liversidge, president, told the stockholders at the recent annual meeting. However, from studies the company has made, he added, "we are optimistic as to the future and look for a resumption of the upward trend in the cycle movement later in the year."

Henry B. Bryans was elected a member of the board of directors. He has been executive vice-president of the company since 1938, and prior to that he was vice-president in charge of operations. Mr. Bryans was elected to fill a vacancy caused by the resignation of W. H. Taylor from the board.

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Spring Sales Drive

East Tennessee Light & Power Co. has inaugurated a nine weeks spring sales activity to sell 450 units, a quota of 20 per cent over similar activities in previous years.

Patent System Seen Aid to Small Units

The United States patent system was hailed last week as the small manufacturer's bulwark against extinction by C. E. Swartzbaugh, president of Swartzbaugh Manufacturing Co. of Toledo, Ohio, and president of the National Electrical Manufacturers' Association.

"The small companies originate and grow only as they can bring forth new ideas, and patent protection is essential to them," Mr. Swartzbaugh said in a statement replying to the request of Dr. Charles F. Kettering, president of General Motors Research Corp. and chairman of the national committee of the U. S. Patent Law Sesquicentennial, for an opinion on the relation of patents to the electrical manufacturing industry.

N.E.M.A. is co-operating with the electrical division of the Bureau of Foreign and Domestic Commerce in preparing the "Parade of Inventions" for the sesquicentennial exhibit in Washington.

"Patent protection provides small companies with their only means of safeguarding new developments until they gain a foothold," Mr. Swartzbaugh declared. "Large companies with greater capital resources and with elaborate facilities enabling them to engage in research have advantages which make patent protection relatively unimportant.

"Through American history patent protection has enabled new enterprises to spring forth and small companies to grow in size and importance. This is a branch of the government which is essential to industrial progress."

Mr. Swartzbaugh said that the real beneficiary of the patent system is the consumer who enjoys the new products and the reduced prices which result from patented inventions and discoveries.

More than 1,200 industrialists, inventors and scientists gathered for a dinner last Wednesday evening in Washington to celebrate the signing of the first patent by President Washington in 1790.

Exhibit of the "Parade of Inventions" was held in the Commerce Auditorium in Washington.

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Rate Hearings Postponed

Hearings in the final stages of the Edison Light & Power Co.'s rate case have been postponed by the Pennsylvania Public Utility Commission until May 8 and 9. The commission, which ordered a $435,000 "temporary" rate reduction in 1937, carried it through two federal courts in Pennsylvania and finally won the case before the United States Supreme Court, now is preparing to order a permanent rate reduction.

MEETINGS

Electrochemical Society—Spring meeting, Galen Hall, Wernersville, Pa., April 24-27. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Illuminating Engineering Society — First annual Pacific Coast lighting conference, Los Angeles, Calif., April 26-27. F. G. Horton, executive secretary, 51 Madison Avenue, New York, N. Y.

American Society of Mechanical Engineers — Spring meeting, Worcester, Mass., May 1-3; semi-annual meeting, Milwaukee, Wis., June 17-21. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Edison Electric Institute—Technical committees, Edgewater Beach Hotel, Chicago, Ill., May 6-9; annual convention, Atlantic City, N. J., June 3-6.

Southeastern Electric Exchange — Annual conference, Hotel Roanoke, Roanoke, Va., May 9-11. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

National Fire Protection Association — Annual meeting, Atlantic City, N. J., May 6-11. Robert S. Moulton, technical secretary, 60 Batterymarch St., Boston, Mass.

Air Conditioning Manufacturers' Association — Annual meeting, tentatively set for The Homestead, Hot Springs, Va., May 10-11. William B. Henderson, executive vice-president, Southern Building, Washington, D. C.

South Dakota Central Station Conference—Annual meeting, sponsored by the North Central Electric Association, Sioux Falls, S. D., May 19-20. W. E. Olson, secretary-manager, North Central Electric Association, 803 Plymouth Bldg., Minneapolis, Minn.

National Electrical Manufacturers Association — Spring meeting. The Homestead, Hot Springs, Va., May 12-17. W. J. Donald, managing director, 155 East 44th St., New York.

National District Heating Association — Annual meeting, French Lick Springs Hotel, French Lick, Ind., May 14-17. John F. Collins, Jr., secretary-treasurer, 1231 Grant Building, Pittsburgh, Pa.

Empire State Gas and Electric Association—Electric operating group, New York, N. Y., May 17. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 19-23. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

Pacific Coast Electrical Association—Annual convention, Hotel Oakland, Oakland, Calif., May 22-24. Harold O. Noack, Hubbard & Co., Oakland, convention chairman.

Northwest Electric Light and Power Association—Accounting and business practice section, Benson Hotel, Portland, Ore., May 23-24. Berkeley Snow, executive secretary, 707 Spalding Bldg., Portland, Ore.

National Association of Purchasing Agents—Annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, June 3-6. G. A. Renard, executive secretary-treasurer, 11 Park Place, New York, N. Y.

Public Utilities Advertising Association — Annual convention, Palmer House, Chicago, Ill., June 23-24. H. W. Olcott, Bozell & Jacobs, Indianapolis, Ind., secretary.

American Society for Testing Materials—Annual meeting Chalfonte-Haddon Hall, Atlantic City, N. J., June 24-28. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

American Institute of Electrical Engineers—Summer convention, Swampscott, Mass., June 24-28. H. H. Henline, national secretary, 33 West 39th St., New York.

Society for the Promotion of Engineering Education—Annual meeting, University of California, Berkeley, Calif., June 24-28.

Canadian Electrical Association—Fiftieth annual convention (Golden Jubilee), Seigniory, Cub, P. Q., Canada, June 25-28. B. C. Fairchild, secretary, 804 Tramways Bldg., Montreal, Canada.

REA Projects Make Payments on Loans

A total of 280 REA systems have, up to February 29, made payments of interest, or interest and principal, out of their operating revenues, according to a memorandum of Harry Slattery, REA administrator, sent to superintendents, managers and directors of nearly 700-REA-financed systems in 45 states. The number of systems in operation at that time was 579. Of the 299 systems not making payments from revenues, Mr. Slattery pointed out that a large proportion are newer systems, in their early development period and not yet obligated to make any payments to the government from their revenues. The remainder are in default.

Mr. Slattery said that total defaults, or payments in arrears, as of January 1 was $56,765. Some systems have made advance payments totaling $140,643. He termed this an "excellent showing."

It was pointed out by Mr. Slattery that of the $176,000,000 loans advanced for REA projects there has been no charge-offs by REA or transfers to an inactive account. No losses have been experienced on any loan and there have been no foreclosures, he declared.

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Lighting Equipment Group Adds to Advisory Board

A group of leaders in the fields of architecture, interior design and industrial design has been selected to membership on the American Lighting Equipment Association's advisory board of design headed by William A. Kimbel, according to Joseph Markel, chairman of the A.L.E.A. board.

The designers who will serve with Mr. Kimbel include Virginia Conner, A.I.D., interior designer; Arthur Loomis Harmon, A.I.A., architect; Edward D. Stone, architect, and Raymond Loewy, industrial designer.

It was stated that the formation and operating plant of the advisory board should effect a noteworthy contribution to home-lighting progress. Mr. Markel said that this constitutes the industry's first organized effort to correlate the thinking of the illuminating engineer, the lighting fixture manufacturer and allied design practitioners.

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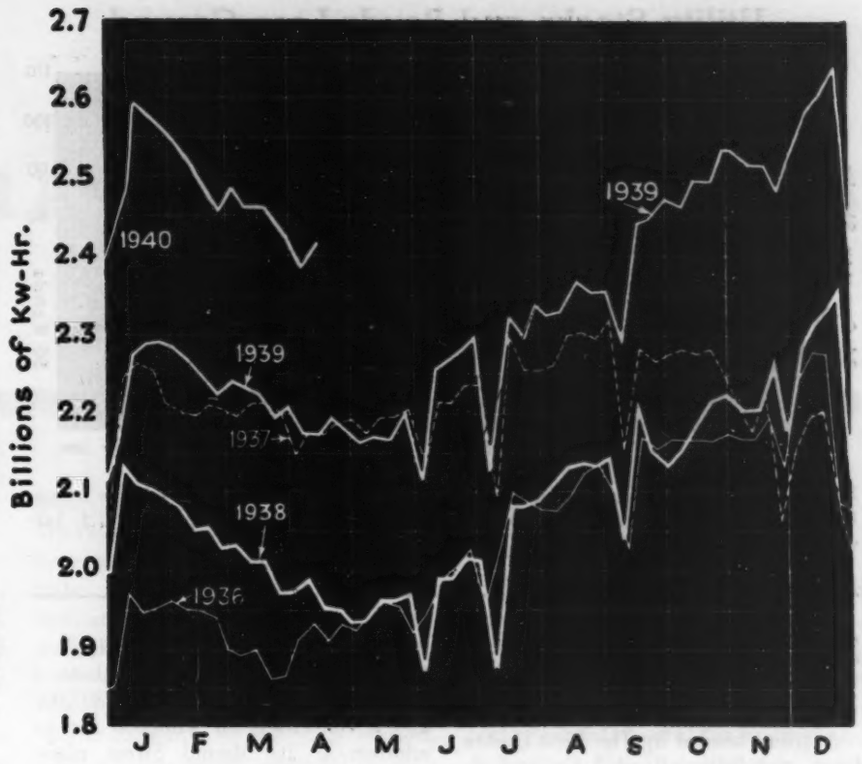
N.E.M.A. Annual Meeting

The annual meeting of the National Electrical Manufacturers Association will be held in the Waldorf-Astoria, New York, the week of October 27.

Output Climbs 1.7% in Week of April 13

With an increase almost matching the decrease in the preceding week, production of electricity by the electric light and power industry moved upward in the week ended April 13 to 2,417,994,000 kw.-hr., a gain of 1.6 per cent over the previous week and 11.4 per cent above the corresponding week of last year, according to the Edison Electric Institute.

After this climb, the output curve stood 23.6 per cent above the corresponding mark for 1938 and 11.3 per cent ahead of 1937. Production was still 8.4 per cent under last winter's peak, as compared with decreases of 8.1, 11.1 and 4.6 per cent for the corresponding weeks of 1939, 1938 and 1937, respectively.



Weekly Output Millions Kw.Hr.

1940		1939		1937	
Apr. 13	2,418	Apr. 15	2,171	Apr. 17	2,173
Apr. 6	2,381	Apr. 8	2,174	Apr. 10	2,176
Mar. 30	2,422	Apr. 1	2,210	Apr. 3	2,147
Mar. 23	2,424	Mar. 25	2,199	Mar. 27	2,200
Mar. 16	2,460	Mar. 18	2,225	Mar. 20	2,211
Mar. 9	2,464	Mar. 11	2,238	Mar. 13	2,213

Per Cent Change from Previous Year

	Week Ending		
	Apr. 13	Apr. 6	Mar. 30
New England	+ 6.4	+ 2.8	+ 4.3
Middle Atlantic	+10.4	+ 6.5	+ 6.2
Central Industrial	+14.5	+13.0	+11.8
West Central	+ 8.0	+ 5.1	+ 6.8
Southern States	+12.6	+10.3	+ 8.0
Rocky Mountain	+14.2	+18.4	+20.9
Pacific	+ 2.0	+ 6.2	+ 9.0
United States	+11.4	+ 9.6	+ 9.6

The drop in earnings was registered by the New England group; greatest decline, by the Pacific Coast region.

Higher Costs Cut Net of New Jersey Utility

Earnings of Public Service Corp. of New Jersey for the first quarter are running slightly higher than for a year ago, Thomas N. McCarter, chairman, told stockholders at their annual meeting this week. Mr. McCarter said that net after all dividends was $945,000 for the first quarter last year and that they were $1,051,000 for the 1940 period.

Earnings for 1940 may not reach the 1939 level, he said, but dividends are likely to remain the same. The drop in earnings will be due to higher coal and oil costs, as well as increased taxes and operating expenses.

Stockholders were told that the corporation would set aside $1,000,000 a year out of earnings to charge off loss in investment in the merger of the traction properties. This merger should be completed in the near future as soon as approval of the different regulatory bodies is obtained. There has been no objection from stockholders.

Mr. McCarter said that "these are terrible times and no one can know the economic consequences." He said that taxes have gone up and that duplication of regulation adds to the difficulty of operations.

Stockholders gave a rising vote of thanks to the management for its efficient operation of the system.

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Arkansas Group Asks Power Bill Support

The TVA may not much longer be able to supply power to the Arkansas Power & Light Co., under terms of its contract expiring in 1943, the House flood control committee was told last week, to bolster demands of Arkansas representatives for creation of a "Little TVA" power development on the White River (see ELECTRICAL WORLD, February 4, 1939, page 332).

Although TVA representatives were not present when the assertion was made that TVA expected soon to need the power being exported to Arkansas, later J. A. Krug, TVA's chief power engineer, did partly substantiate the statement. Mr. Krug said that if demand for power within TVA's territory continues to increase during the next six months, as in the past six months, some change in terms of the contract with the utility might be required. Under the present contract the Arkansas utility is taking 10,000 kw. of prime power from TVA, 5,000 kw. of dump and 25,000 kw. of secondary.

Testifying before the committee, Tom Fitzhugh, chairman of the Arkansas Department of Public Utilities, and Representative Wade Kitchens asked authorization of the proposed Bull Shoals and Table Rock reservoirs on the White River for multiple-purpose reservoirs, at an estimated cost of $73,000,000. The committee was also requested to increase the authorization for the Norfolk reservoir on the same stream by an additional $14,500,000, in order to permit multiple-purpose development.

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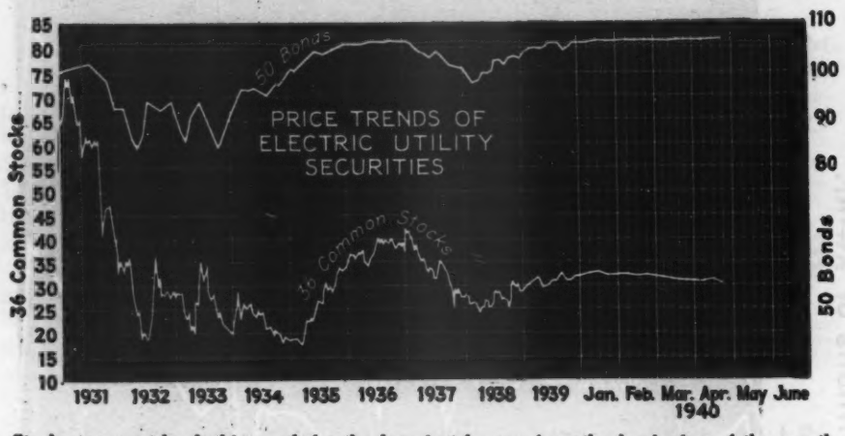
Grants Byllesby Extension

H. M. Byllesby & Co. and the Byllesby Corp. have been granted, in a SEC order this week, an additional two weeks time in which to adjust their business to comply with the utility act. The commission found that the companies were "making a diligent effort to adjust their business to the situation."

Utility Stocks and Bonds Lose Ground


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
50 Bonds
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 1939 Jan. Feb. Mar. Apr. May June 1940

Stocks were set back this week for the heaviest losses since the beginning of the month. Utility securities followed the general trend. "Electrical World" stock index, 31.5; last week 31.9, last year 28.4. Bond index, 106.1; last week, 106.3

Stock Is Offered for Kansas Utility

A group headed by The First Boston Corp. and Dillon, Read & Co. and including 38 other underwriters offerred this week the new 4½ per cent series preferred stock of the Kansas Power & Light Co. of $100 par value at the price of $103 per share plus accrued dividends.

Of the entire 139,169 shares of this offering, 96,380 shares were offered subject to the prior right of holders (other than a parent of the company) of the outstanding preferred stocks of the company to exchange their shares for the new 4½ per cent preferred stock on a share for share basis plus a cash adjustment based on the difference between the redemption price of the old stock and the offering price of the 4½ per cent stock.

Net proceeds will be applied toward the retirement of all the outstanding 6 per cent and 7 per cent preferred stocks of the company, which are redeemable at $105 per share and accrued dividends.

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Laclede Power Proposes $372,750 Note Issue

Laclede Power & Light Co. of St. Louis has applied to the Missouri Public Service Commission for authority to issue $372,750 in notes, maturing over a period of three years, in connection with the purchase of $497,000 in additional equipment for an addition to its electric generating plant in St. Louis. The balance of the purchase price, in excess of the amount of the notes, would be paid in cash, it was said.

The company stated in the application that it proposed to purchase a steam turbine generator for $397,000 and a condenser for $100,000 for an addition to its Mound Street plant.

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Central Indiana Power to Merge Subsidiary

Application for the merger of Central Indiana Power Co. and Northern Indiana Power Co., subsidiary, is soon to be filed with the Indiana Public Service Commission and the SEC, L. B. Schiesz, president, revealed in the annual report to stockholders.

Mr. Schiesz said that the consummation of this merger will result in the simplification of the company's corporate and financial structure and will produce savings in taxes and corporate expense.

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Takes Dividend Action on Preferred Arrears

C. E. Calder, president of American & Foreign Power Co., Inc., has announced that the board of directors at a meeting held April 10 declared a dividend of 30 cents per share on the $6 preferred stock and 35 cents per share on the preferred stock ($7) for payment on June 15 to stockholders of record on May 25. These dividends are on account of accumulations for the quarter ended March 31, 1932.

As of March 31, after taking into consideration the dividends declared April 10, the undeclared accumulated dividends amounted to $48.90 per share on the $6 preferred stock and $57.05 per share on the preferred stock ($7).

West Penn Common Stock Issue Offered

Another common stock issue of an electric light and power company was put on the market last week when 160,000 shares of common stock of West Penn Power Co. was publicly offered at $27 a share by a banking syndicate headed by W. C. Langley & Co. Simultaneously the banking syndicate publicly offered $3,500,000 of first mortgage, series K, 3 per cent bonds, due March 1, 1970, at 104½ and accrued interest.

Net proceeds from the sale of the securities will be applied to the completion or construction of improvements, additions and betterments to the company's plants and property.

The SEC made effective the declaration of the company covering the public offering of the bonds and stock. The only unusual condition imposed required the company to physically attach to its stock prospectus the portions of the commission's opinion headed "Property and Investment Account," which discusses certain "inflated" values carried on the company's books, "ratios to property and investment accounts," which discusses the ratio of debt to assets on various bases and "certain adverse factors," which relates that the company is involved in a Pennsylvania rate case, that it may be required to increase its depreciation requirements and that West Penn had reported an amount of more than $12,000,000 as representing the excess of book value of its property over original cost.

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Michigan Gas Dividends

Directors of the Michigan Gas & Electric Co. have declared a dividend of $1.75 per share on the 7 per cent prior lien stock and one of $1.50 per share on the $6 prior lien stock, both payable May 1 to holders of record April 15. Dividends are in arrears on both issues.

Utility Reports

	Net Income 1940	1939
*Arkansas Power & Light...	$1,236,513	$1,277,058
*Carolina Power & Light...	2,298,224	2,504,707
*El Paso Electric.....	380,089	346,944
*Gulf States Utilities.....	2,643,583	2,133,255
*Houston Lighting & Power	2,766,989	2,993,771
*Louisiana Power & Light..	1,069,381	962,153
*Louisville Gas & Elec. (Ky.) and subs.	2,841,613	2,582,532
*Minnesota Power & Light	1,375,186	1,140,452
*New Orleans Public Service	2,049,138	1,631,088
*Oklahoma Gas & Electric	2,820,507	2,349,126
*Pacific Power & Light.....	881,831	876,106
*Puget Sound Power & Light and subs.	2,161,690	1,551,754
*San Diego Consol. Gas & Elec.	1,348,343	1,468,679
*Virginia Electric & Power	3,846,772	3,531,037

*Twelve months ended January 31.

OPERATING PRACTICES

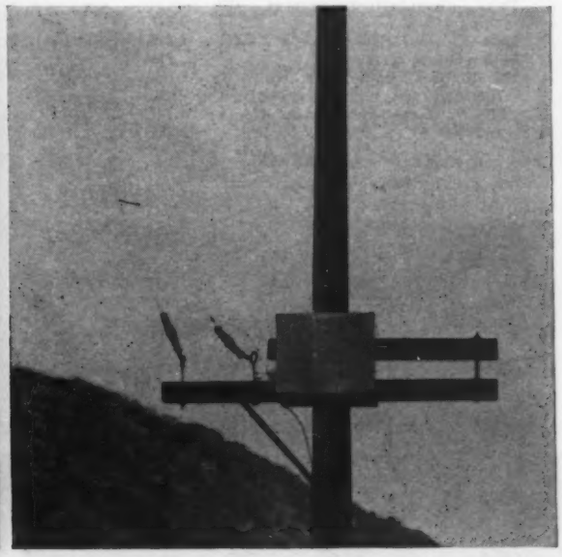
New England Power Adds Radio Facilities

Short-wave radio units for both telephone and telegraphic communication in emergencies recently added to the New England Power Association system embody several interesting features associated with the organization's efforts to strengthen its communication facilities and overcome handicaps resulting from interruption of normal telephone and telegraph service in the important operating areas centering at Shelburne Falls and Millbury, Mass. The equipment, furnished by General Electric, provides for radio telephony between these points on a frequency channel of 2,726 kilocycles and for telegraphing at 3,190 kilocycles. Power output is 250 watts on each channel and separate crystal control is provided for each channel to insure stability.

Two-way radio contact is now available in the event of wire service unavailability or abnormal conditions between these offices, which are 80 miles apart. The transmitters at each station are provided with an antenna with 157 ft. effective length, of the half-wave, single-wire, single-fed type oriented to radiate maximum energy in the direction of the other station. Two wooden masts about 80 ft. high support each aerial. The receiving equipment is provided with a separate, single-wire antenna at each station. In transmitting energy from the station interior to the aerial tuning network a coaxial underground cable with a conductor, carried on porcelain wafer supports in a $\frac{1}{8}$-in. copper pipe with nitrogen filling, is used. From network to antenna quarter-wave, open-wire feeders are employed. The receivers are designed to intercept all frequencies between 1.7 and 30 megacycles and are of the "HRO" type.

Cost Data of 110-Kv. Line

Records of a power system which recently built a 17.8-mile, 110-kv., single-circuit, steel tower line to interconnect two important load centers yielded the following approximate cost data useful for engineering estimates. The line traverses semi-rural country of rather flat terrain, the right of way being 250 ft. wide with a switching station at one end and a step-down substation at the other. Semi-flexible steel towers spaced about 600 ft. apart on the average, three 300,000-circ.mil copper power conductors on 9–8–9 disk insulators and two $\frac{7}{16}$-in. crucible steel ground wires attached to the outer ends of the top chord of the tower framing were used. Grading rings were provided at the conductor ends of the suspension insulators and the average height of the copper



COMBINED RADIO TELEPHONE-TELEGRAPH EQUIPMENT at Shelburne Falls office; Robert W. Barton, radio supervisor, at switchboard (left). Antenna tuning unit on pole, showing cable connection from operating office and open-wire feed to antenna (right)

conductors above the ground is 35 ft.

At the switching station end a 110-kv. oil circuit breaker was installed, but at the receiving end air break switches only were installed between the incoming line and the transformers. At the latter point two 25,000-kva. transformers reduce the potential to 23 kv. for local transmission purposes via four outgoing circuits, five oil circuit breakers being provided for bus tie and feeder control on this side of the substation. Carrier relaying is also provided for the line. The over-all cost of the line and its immediate facilities at both terminals approximated $830,000, as follows:

Right-of-way and land for terminal substation—Total cost, $299,290	
Including substation property 13.7 acres	$19,100
Aerial survey	1,188
Clearing land	27,335
Transmission line—Total cost, $242,411	
Including the following typical major items:	
Tower steel, 1,071,563 lb.	46,660
Copper wire, 258,536 lb.	35,911
Galvanized wire, 7-strand, 7/16 in., 190,080 lb.	6,061
Galvanized wire, 7-strand, 3/8 in., 20,592 lb.	1,789
Suspension insulators, 5,240 discs	7,564
Drilling and blasting for tower footings	6,420
Labor	59,872
Terminal Substation—Total cost, $263,889	
Including the following typical major items:	
Two 25,000-kva, 3-phase, 110-kv./25-kv. transformers	115,800
One transformer transfer car, 8 ft. 9.5-in. gauge, capacity 9 tons	650
Five 34.5-kv. oil circuit breakers, 1,200 amp.	34,290
Nine lightning arresters	3,950
Two 3-pole, 115-kv. vertical air break switches, 600 amp	2,812
Switchboard, instruments, carrier equipment, etc.	29,555
Switching Station Equipment—Total cost, $27,062	
Including the following typical major items:	
One outdoor type oil circuit breaker, 115 kv., 3-pole, single-throw, 600 amp.	16,257
Three disconnecting switches, 600 amp., 115 kv.	3,811
Labor	4,015
24 insulators	216
178 lb. bare copper wire, No. 4/0, 7-strand	27
1,528 ft., 6-conductor cable, No. 6 and No. 8	455
Total cost of complete job, $827,652	

Special Hardware for River Crossings

Unusual loadings which the major river crossings of the Bonneville project are calculated to support necessitated specially designed hardware supporting the conductor and overhead ground wires.

The conductor (extra-high-strength A.C.S.R.) is attached to the terminal towers by means of a dead-end assembly designed to carry a maximum load of 90,000 lb. Each assembly consists of two yokes cast of special high-grade steel. Lower yoke connects with the dead-end fitting of the conductor; upper yoke is attached to the crossarms of the towers. Between the two yoke plates are assembled six strings of insulators, each consisting of eighteen units. Upper yoke plates carry six double-spring assemblies designed to provide a cushioning effect under impact loads the dead-end assembly may be subjected to, as well as to serve as an adequate means of equalizing the loads carried by each individual string of insulators.

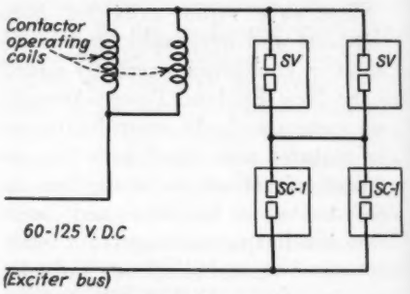
At the high suspension towers of both the Bradford Island crossing and the Columbia crossing (ELECTRICAL WORLD, March 9, 1940,) the conductor is supported by two specially designed high-strength clamps hung from two insulator assemblies arranged to form a parallelogram with the supporting crossarms. In the case of the Bradford Island crossing each of the insulator assemblies is in itself a triple-strung assembly (a total of six strings) consisting of sixteen units per string; the Columbia crossing assembly (illustrated) is made up of double-string assemblies.

The 3/4-in. diameter extra-high-strength overhead ground wires are dead-ended to the terminal towers by means of specially designed fittings employing the wedge-type principle of pressure engagement between the fitting and the wire. Hardware was supplied by Brewer-Titchener Corp. on bid through jobbers.

•

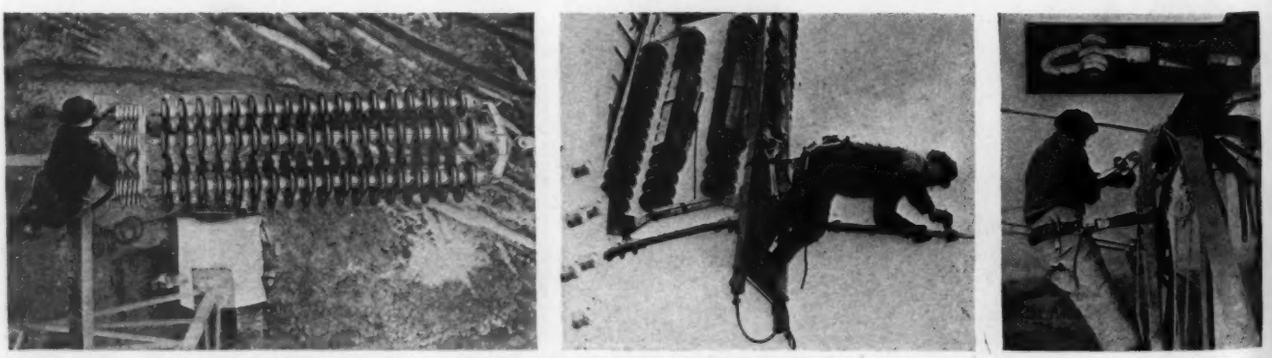
Relays Protect Underexcited Generators

Generators at the Spencer, Neb., hydro plant of the Interstate Power Company are operated underexcited for voltage regulation. The station is connected to long transmission lines that require considerable leading charging current. A relay scheme has been developed for this plant to insure that the two 1,100-kw. underexcited generators will deliver sufficient current to operate protective relays in the event of a fault on the line.



UNDERCURRENT and overvoltage relays protect generators

The scheme uses two under-voltage type SV relays, actuated by variations in phase voltage. At times of a fault on the line these relays operate through two type SC-1 instantaneous overcurrent relays to energize two contactors. Contacts of the SV relays are in series with those of SC-1 relays so that both SV and SC-1 relays must close contacts to operate the con-



UNUSUAL HEAVY LOADING REQUIREMENTS dictate design of hardware for Bonneville river crossings—Dead-end assembly (left): Columbia river crossing suspension tower insulator assembly (center): overhead ground wire dead-end fitting (right)

Here's a low-cost way

to Increase Customer Satisfaction
Promote Load Growth
Reduce Revenue Losses

Type BIS Induction Voltage Regulator

There's Profit in Voltage Regulation

Case I Voltage levels and customer service on a 10-mile branch feeder of a southwestern utility were improved by installing two G-E induction regulators at a point four miles out on the line. Rebuilding of the line was avoided, *at a saving of $1,600.*

Case II A midwestern power company was able to bring well-regulated power to a remote village at low cost through the use of two G-E induction regulators. Instead of constructing a 13,800-volt line, a 6900-volt line was used with the two regulators — *at a saving of $2,000.*

BECAUSE of the economy and flexibility features of the improved G-E induction regulators, accurate voltage regulation can now be economically justified on practically every one of your distribution feeders.

The lower initial cost of these regulators saves you from 10 to 12 per cent over previous designs. Flexibility of application permits easy, time-saving installations *either indoors or out.* Reduced space requirements, simplified inspections, and lowered maintenance costs are added benefits—and the prevention of kw-hr revenue losses through improved voltage conditions, satisfied customers, and consequent load growth make it possible for these regulators to actually *pay their own way.*

Your electric service is judged by the voltage you deliver at your customer's service entrance—and smoothly regulated "straight-line" voltage is the shortest path to customer satisfaction. It will pay you to get complete information on these improved G-E regulators. Ask your nearest G-E representative for Bulletins GEA-2985A and GEA-2018D, or write to General Electric, Schenectady, N. Y.

Two G-E Type BIRS indoor-outdoor induction voltage regulators installed outside a substation

GENERAL ELECTRIC

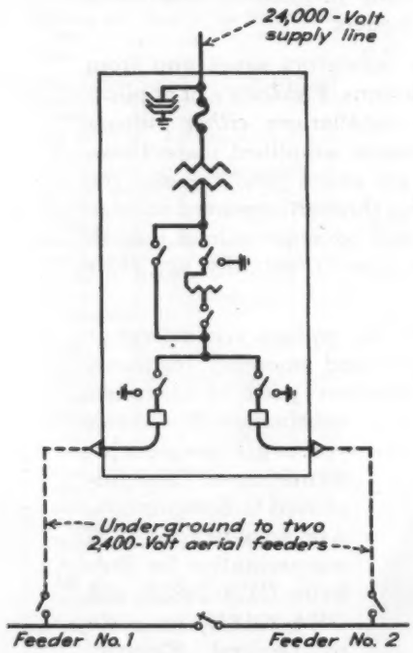
tactors. Thus, both low voltage and overcurrent must exist simultaneously to operate contactors. One contactor short circuits the generator field rheostat; the second short circuits the exciter field rheostat, building up exciter voltage to its maximum quickly and impressing full exciter voltage across the generator field.

•

New Substation Meets Modern Requirements

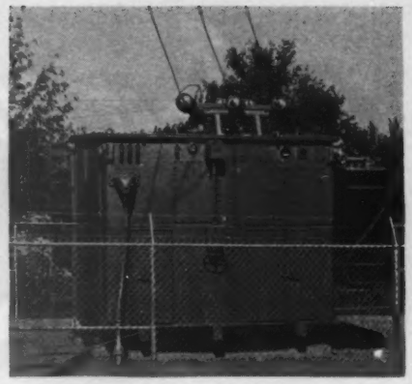
By R. D. IDEN and R. C. SNYDER
Ohio Public Service Company, Mansfield, Ohio

Load increases, resulting from an aggressive sales program and from a rapid residential development in the south side of Mansfield, necessitated a new distribution substation and additional primary feeders somewhat sooner than previous studies had indicated. The average annual use of electric service by domestic customers in the area increased, during the past ten years, from 675 to 1,270 kw.-hr. Since 1928 more than 1,000 new dwellings have been built in the area and a large junior high school has just been completed.



TAP CHANGER can be by-passed; air switches and disconnects for both feeders from unit substation

Because a new substation would have to be erected in a closely built-up residential district for best distribution efficiency a modern inclosed



CSP power substation, 2,000 kva., 24,000 to 2,400/4,160 wye volts, with load tap changer and two low-voltage feeders

substation was installed in the least prominent of the few sites available. A modified design of a CSP power transformer was worked out with Westinghouse engineers to meet the particular requirements. This differed from the standard unit only in respect that air switches were provided for two feeders instead of one, by the addition of a disconnecting switch for each air switch and by some slight changes in control equipment. Other disconnecting switches provide for by-passing and isolating the load tap changer. Reference to the line diagram shows the provision made for emergency switching.

The transformer is rated 2,000 kva., self-cooled, and 2,500 kva. with blowers added. The Deïon air switches are rated 600 amp., 100,000 kva. They are relayed for automatic reclosure, each being separately controlled with the exception that the thermal relays operate on the combined load of the two feeders and open both air switches if the transformer becomes dangerously hot. All disconnecting switches operate by hand wheels externally mounted and are suitably interlocked for safety of operation. For the present the unit will operate at 2,400 volts delta, but all internal wiring is arranged for easy cut-over to wye connection.

Although independent voltage regulation of the two radial type low-voltage feeders is not possible, this should not present a serious problem, since they are of the same conductor capacity and approximately the same distance to load centers. Initial loads on the feeders are nearly equal and it is reasonable to expect they will increase at about the same rate.

Building of the transformer, construction of two 2.4-kv. feeders and 5 miles of 24-kv. supply line and installation of the new unit, including placing it in regular operation, were completed in 70 working days. The completed cost of the substation was 16 per cent under the estimated cost of a substation of the conventional type with open steel bus structure and assembled equipment.

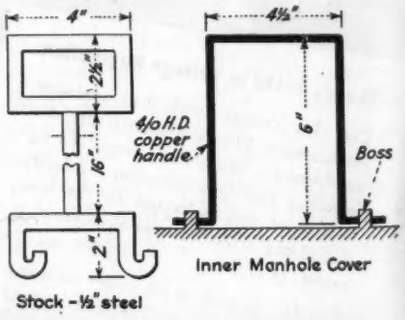
•

Rustproof Handles for Manhole Covers

Mild steel handles on the watertight inner covers of manholes on the Kansas City Power & Light underground system frequently rusted out, particularly in low-lying areas, becoming not only useless but a hazard to men handling or opening the manholes.

Practical answer to this problem on the Kansas City system has been installation of copper handles made from No. 4/0 hard-drawn copper wire inserted in the same bosses that formerly held the mild steel handle. The copper handles, which have a 4½-in. grip and 6-in. offset, have been used for several years and have worked out satisfactorily. It appears that they will last indefinitely.

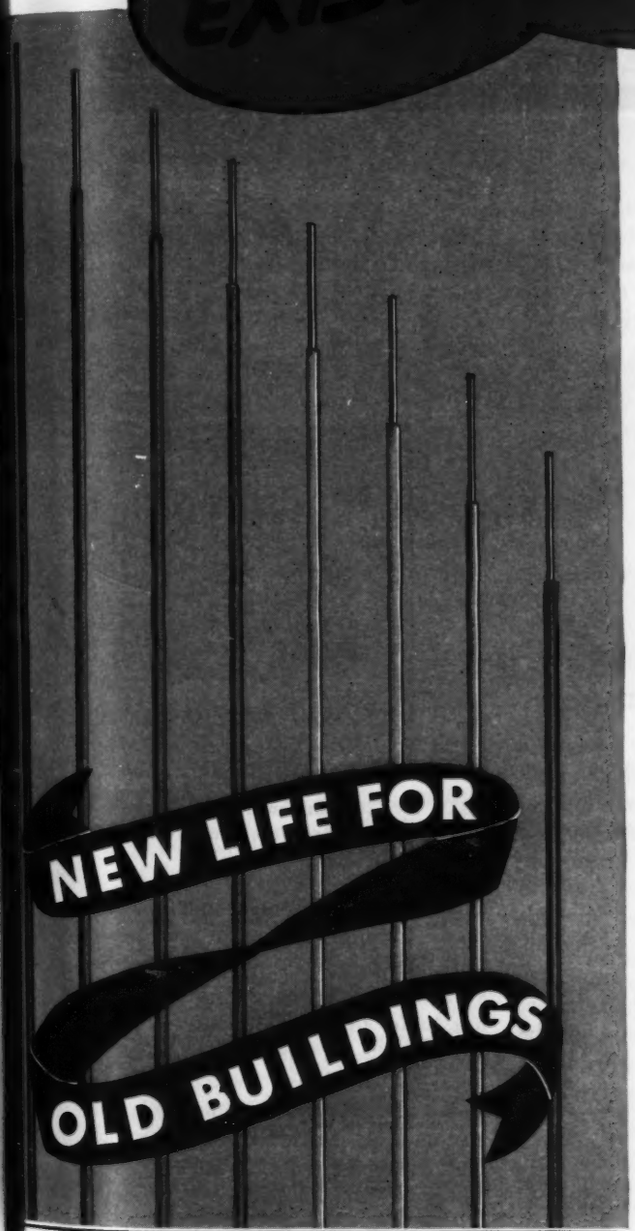
For handling these inner manhole covers a number of simple lifters have been made up from ½-in. steel stock, which makes the job much simpler and safer.



SIMPLE LIFTER (left) for handling manhole covers. Copper handles (right) solve problem of rust-destroyed inner manhole covers

Details of the lifter, which can be made up by any blacksmith at a cost of less than $1, are shown in the accompanying illustration. Two men, each equipped with a lifter, can hook on to the handles of a manhole cover with these and shift it about at will without the need for straining in awkward positions.

FOR REWIRING EXISTING RACEWAYS



G-E PRESENTS

FLAMENOL

Small Diameter Building Wire

Hooray! at last!

Now! Existing buildings need no longer be starved for electrical current. *Wattages can be increased inexpensively* by rewiring raceways with Flamenol Building Wire. This small diameter wire is *available in sizes 14 to 4/0 inclusive.* It is insulated with a plasticized polyvinyl chloride compound which is tough, long aging, flame retarding . . . has high dielectric and mechanical strength . . . resists oil, acids, alkalies and moisture. The compound serves both as an insulation and as a finish.

We can have new branch circuits and feeders

Small Diameter

The reduction in the diameter from .190" to .130" for #14 AWG wire, for instance, makes it possible to install nine #14 wires (pending 1940 Code) in a ½-inch conduit instead of the present four #14 wires (see table below for comparative overall diameters). As an example, it will be possible to *increase wattage from 2760 watts to 10368 watts by using 8 Flamenol building wires and changing the system from 2-wire, single-phase to 4-wire, three-phase.*

3.7
2760)10368.0
8280
2088 0
1932 0
1560

Flamenol building wire may be obtained in a variety of bright, permanent colors. Color goes all through the insulation and therefore may easily be determined by cleaning or scraping if the wire becomes soiled. A hard glossy wax surface makes wire pulling easy.

Elec. Dept. pl. investigate: 3.7 times more wattage. Relighting possible now.)

Features of Flamenol Building Wire

1. *Small Diameter*—Saves space, makes wiring jobs easier.
2. *Superaging*—Ages better than rubber-insulated wire.
3. *Easy Pulling*—Has hard, smooth, glossy surface.
4. *Heat Resistant*—Rated at 60 deg. C.
5. *Free Stripping*—Makes splicing and soldering easier.
6. *High Dielectric Strength*—720 volts per mil, test result.
7. *Flame Resistant*—Will not support combustion.
8. *Tough Insulation*—Tensile strength of 2000 lb. per sq. in. test result).
9. *Many Colors*—Same colors normally supplied on Type R wires.
10. *Oil Proof*—Unaffected by oils, water, acids and alkalies.
11. *Attractive*—Dirt, etc. does not readily adhere to wire's surface.
12. *Self-protecting*—Protection needed only against severe mechanical abuse.

For Further Information

See the nearest G-E Merchandise Distributor or write to General Electric Company, Section W-0134 Appliance and Merchandise Department, Bridgeport, Connecticut.

COMPARISON OF DIAMETERS

Size AWG	Approximate Overall Diameter (In.) Rubber Covered Types R, RP, RH	Approximate Overall Diameter (In.) Flamenol Type SN	Size AWG	Approximate Overall Diameter (In.) Rubber Covered Types R, RP, RH	Approximate Overall Diameter (In.) Flamenol Type SN
ol.	.193	.130	1 Strd.	.568	.496
ol.	.210	.147	1/0 Strd.	.609	.537
ol.	.231	.168	2/0 Strd.	.655	.583
rd.	.322	.246	3/0 Strd.	.706	.634
rd.	.398	.314	4/0 Strd.	.764	.692
rd.	.447	.363		up to 2,000,000 CM	
rd.	.507	.423			

GENERAL ELECTRIC

INDUSTRIAL ENGINEERING

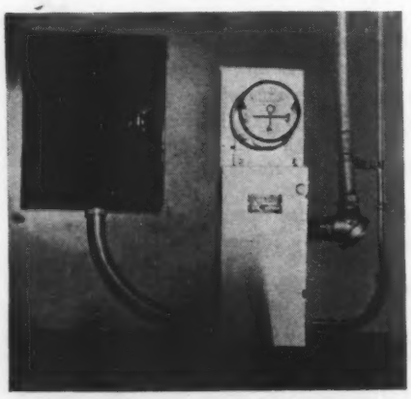
Emergency Tie for Lighting Service

By C. C. HERMANN
Philadelphia, Pa.

To provide for continuity of lighting in the event of a main power-and-light supply interruption, Proctor & Schwartz & Company, Philadelphia, Pa., has installed a rather simple emergency tie.

Main supply to the plant is a 2,300/220-volt, three-phase supply from the Philadelphia Electric Company. A separate 220-volt, single-phase, three-wire (No. 4 wire) feeder circuit is brought into the plant in 1¼-in. conduit to provide the emergency tie. (This separate supply is the utility's regular residential lighting service serving the district around the plant.)

In the event of an interruption of service from the main power supply, a cable provided with end clips on each wire is secured to the light circuit switch bars on the main panelboard and to the fused cut-out in the four-circuit emergency panel. Thus current is fed from the emergency service through the lighting switch on the main panelboard to the supervised plant circuit. Since the emergency service is not sufficient to carry the entire lighting load, only the four most essential circuits are supervised in this manner. An auxiliary kilowatt-hour meter is provided for the emergency circuit.



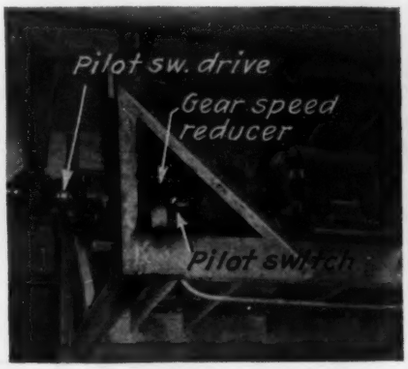
EMERGENCY CIRCUIT (in conduit) is brought in at right of meter panel to main switch (below meter) to four-circuit fused cut-out panel at left. Main power-and-light switchboard not shown

•

Shaft Switch Prevents Motor Overheating

Overheated motors may become a real menace to safety in plants, such as the General Foods corn mill at Kankakee, Ill., where grain dust is present in the air in fairly large concentrations unless steps are taken to prevent such overheating. At this plant certain motors, such as the one shown, which drives a large line shaft, are provided with shaft-driven, pilot control switches which shut the motors down promptly when load reaches a point where excessive heating is likely to occur.

The shaft-driven switch consists of two disks mounted on the same centers and placed in close proximity to each other, with their lower portions immersed in heavy oil. One of these disks is free to rotate continuously and is attached to a shaft that extends outside the case and which is attached to the driven shaft. The second disk is free to rotate only between limits of approximately 18 deg., at which point it closes a set of contacts. These contacts are held open by centering springs which are adjusted from outside the case. The contacts are closed only when the speed of the rotating disk and the viscosity of the oil transmit torque to the second disk sufficient to overcome the pressure of the centering springs. Thus, with overload on the motor, speed of the driven shaft falls off and the switch contacts open, stopping the motor.



PILOT SWITCH driven from line shaft stops motor as speed drops on overload

In starting the motor with this switch arrangement an extra switch has to be provided in parallel with the contacts of this device. On starting, this auxiliary switch is held closed until the motor comes to speed and is then released, allowing the pilot switches to take control of the motor.

•

Inspection Accuracy Increased

To offset the shadow cast by the exhaust hood of a gumming brush stand in the factory of the Doyle Shoe Company, Brockton, Mass., a 25-watt tungsten lamp was formerly suspended above the operator, who

THEY TRIED 36..
..GAVE THEM THE WORKS
..THEN ORDERED
1,176 MORE!

Large Utility Modernizes 202 Old Breakers with Allis-Chalmers "QUICK-QUENCH" Ruptors! Read How You Can Increase Interrupting Capacity ... Lower Your Maintenance Costs!

When a large utility increases interrupting capacity ... slashes maintenance costs without buying breakers ... without any changes in existing cell structures or bus and feeder connections ... that's important news for every system engineer!

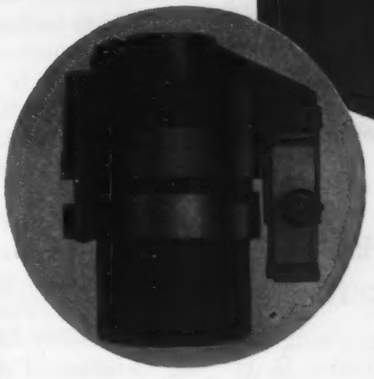
Here are the facts!

One of the country's largest utilities was recently faced with the necessity of increasing its interrupting capacity to meet an increase in load. Naturally, they wanted to do it as cheaply as possible. They discussed several methods ... discarded them as too expensive.

Then they heard how other utilities were modernizing with Allis-Chalmers "QUICK-QUENCH" Ruptors! They ordered Ruptors for six breakers as a trial ... tested them far beyond rated capacity ... really gave them the works!

The results of this test proved so satisfactory that they ordered 1176 more Ruptors ... increased the interrupting capacity and efficiency of 196 more breakers!

That's what you can get when you modernize your breakers with Ruptors ... or when you add new Allis-Chalmers Ruptor-equipped breakers to your system.



BY MODERNIZING WITH "QUICK-QUENCH" Ruptors, the interrupting capacity of this 600 amp, 15 kv Oil Circuit Breaker was greatly increased.

And while you're getting the advantages of Ruptor design, you're also getting the same low-cost operation for which Allis-Chalmers Oil Circuit Breakers are known! Oil carbonization and contact deterioration are cut to a minimum ... for Ruptors handle more interruptions before inspection and renewal of oil or contacts becomes necessary.

Let a trained engineer in the district office near you show you how Allis-Chalmers engineering superiority can work for you! To get more breaks for your money, specify Allis-Chalmers Breakers, Ruptor-equipped!

A-1139

Over 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

SWITCHGEAR DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

FLUORESCENT LAMP reduces shadow

works facing a window. This was recently replaced by a 20-watt fluorescent tube unit mounted 30 in. above and 24 in. in front of the brush wheel, with greatly improved results in connection with the ability of the operator to spot defective conditions in the shoe soles handled at this point.

The daylight effect of the tube and uniform light distribution along its length, combined with the larger and properly inclined reflecting surfaces, have proved helpful in lighting the surface of the material intensively and with suitable color for inspection.

•

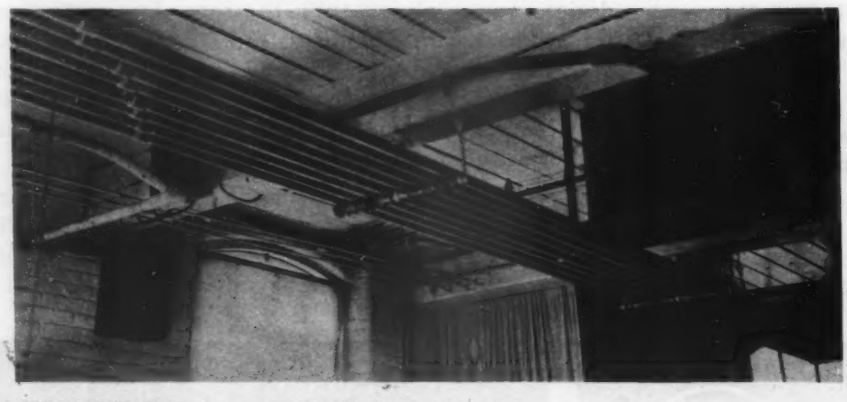
Flexibility Marks Capacitor Layout

With 203 motors aggregating 242 hp. installed in its Pawtucket, R. I., factory for the making of women's dress goods, the Rhode Island Fabrics Company's capacitor equipment has raised the power factor to about 85 per cent with but 50 kva. in static condenser capacity provided. Several years ago, when the connected motor load was about half the present total, the power factor was approximately 71 per cent. A study of the load conditions in relation to the rates of the Blackstone Valley Gas & Electric Company, which serves the plant, indicated the desirability of placing a few capacitor units on the premises, and today three of these are in service.

There are 192 motors of ¾-hp. rating in use, each loom being individually driven; one 40-hp., two 15's, two 5's and six 3-hp. motors in the establishment. The December demand of the plant was 165.6 kw., the power factor average for the month being 82 per cent. Induction motors are generally used.

For service during normal operating hours one 20-kva. and one 25-kva. capacitor were installed, with 220-volt push-button control and magnetic contactor switching. A typical ceiling installation is tapped off a three-phase, No. 2/0 power feeder, with fuse box adjacent to the feeder run and contactor cabinet adjoining the shunt capacitor frame. A pilot light on the push button indicates whether or not the capacitor is on the line. All rigid conduit is grounded. Light-load correction is provided from a single 5-kva. unit, which raises the power-factor to approximate unity from 60 per cent with a load of the order of 10 hp. This unit is always across the line, contributing to corrective work 24 hours per day and requiring no switching.

The Eastern Electrical Engineering Company, Pawtucket, made the installation.



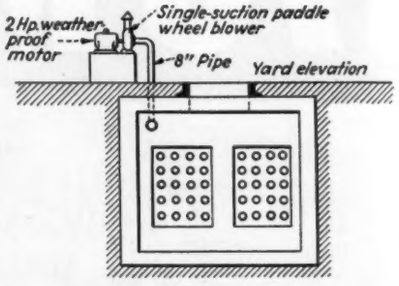
CAPACITOR UNIT improves light-load power factor

Ventilate Cable Ducts in Hot Mill Area

By C. M. MYERS
Electrical Engineer
Youngstown Sheet & Tube Company, Youngstown, Ohio

A simple, yet effective, low-cost ventilating system for cable ducts is used to insure adequate air circulation around power cables in certain portions of the Campbell Works of the Youngstown Sheet & Tube Company, where a heavy power concentration exists in combination with high ground temperatures.

One such location is in the cold strip mill and annealing furnace district where 30 active 6,600-volt, three-conductor, 400,000-circ.mil lead-covered cables are housed in two



SMALL SUCTION FAN draws hot air from manhole and adjacent cable ducts in region of high ground temperature and high power concentration

20-hole concrete ducts roughly 3 ft. high and 2 ft. 6 in. wide, spaced about a foot apart, with air space between. Cables are carried in 4-in. diameter fibre conduit on 6-in. centers in the concrete ducts. The ducts are surrounded by slag fill having a temperature in the vicinity of 60 deg. F.

Sufficient air circulation around the cables in this area has been secured by mounting a small single-suction, paddle-wheel blower, driven by a 2-hp. motor, above one of the manholes and connecting the intake of the fan to the manhole so that air is drawn from the manhole through the two adjacent 200-ft. duct runs.

The fan used is capable of delivering about 700 c.f.m. and operates at a discharge pressure of about 7 in. of water. Relatively high pressure is required in order to force only sufficient air through the small space around the fireproofing at the duct entrance in the manhole to carry away the heat, without adding a great deal of heat in the summer time when the outside temperature is high.

WANTED
5000 SALESMEN
to Act as Load-builders

Must be able to introduce and sell every known kind of current-consuming equipment and appliance to dealers, contractors and industrial plants, and be prepared to make immediate deliveries of same.

Must have years of successful experience in this work; make 8 calls a day; and be tireless in promoting the sale and use of electrical merchandise of every description.

It is understood that all men answering above requirements will be paid, as heretofore, by their employers, the Electrical Wholesalers of America!

An Imaginary Advertisement

This imaginary advertisement need never run. The 5000 Salesmen are already hired. In fact they started off to work at 8 o'clock this morning. By sundown the wholesale houses they represent will have distributed a couple of million dollars worth of load-builders, in one form or another.

Someone has said, "Reciprocity is the basis of enduring public relations."

As manufacturers of electrical equipment operating under the T&B Plan, we are casting our lot wholeheartedly with our T&B Wholesale Distributors. We promote their interests exclusively, have an inflexible one-price policy, and do not sell direct. We believe this to be good business for them, and by the same token good business for us.

#10
A series of advertisements designed under the T & B Plan to set forth the economic reasons for the fixed T & B Distributor policy.
The T&B DISTRIBUTOR SERVES and SAVES

T&B

THE THOMAS AND BETTS CO., INC.

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N.J. • Sales and Service offices in 23 leading cities

T & B Distributors cover United States and Canada

NEW ENGINEERING IDEAS

One Instrument Checks Large Meter Range

To check meters from full load down to one-twentieth load it is usually necessary to employ at least two ordinary rotating sub-standard instruments, one serving from full to one-quarter load and the other, with a lower current rating, serving for one-tenth and one-twentieth loads and avoiding running a sub-standard meter below one-quarter load.

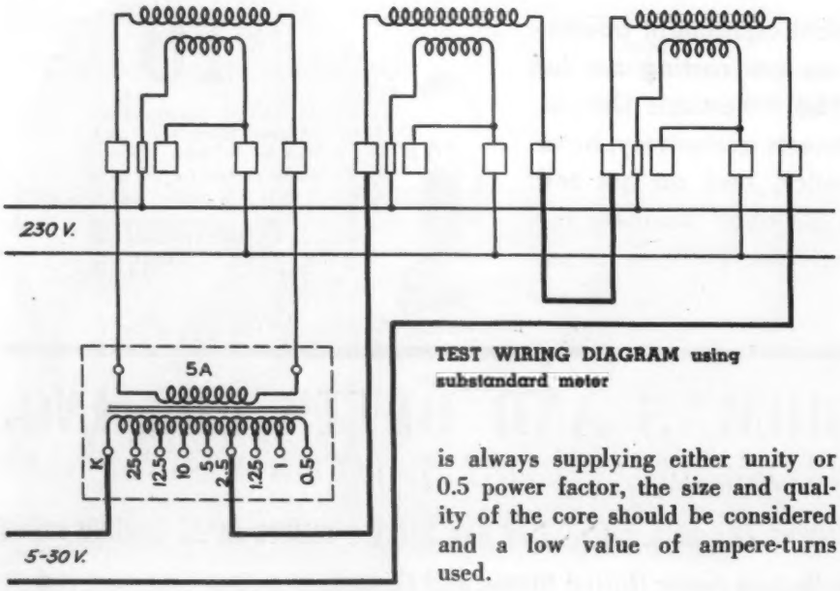
To overcome this difficulty a new substandard instrument, described in the *Electrical Review* (British), has been produced to cover a large range accurately with one meter, particularly with small loads. A model has been in continuous use, checking thousands of meters. It consists of a meter element of the same type as that with which it is proposed to be used most, complete with rotor, bearings, magnet and an indicator. A multi-range current transformer is connected as shown in the diagram and a pair of stout flexible leads are calibrated with it. With d.c. a similar system can be employed by using a multi-range current shunt and a d.c. meter element.

To construct this model a 5-A, 200-250-volt, 50-cycle meter was taken, the counter removed and a revolution indicator fitted; this consists of a balanced pointer and worm wheel only, the pointer moving over a scale divided at every five revolutions and adjusted to be on a division when the calibration mark is in the center at the front. The current circuit is connected to the secondary winding of the transformer by stout leads and calibrated as a 5-A meter at full load, with unity and 0.5 power factor.

The transformer used is so wound that the primary tappings correspond to the current required for the usual test loads. Since the transformer is always supplying either unity or 0.5 power factor, the size and quality of the core should be considered and a low value of ampere-turns used.

When checking periodically, it is only necessary to take two or three ranges to be assured that all are correct, which saves tedious checking and cross-checking on one-twentieth load.

A necessary requirement is that the revolutions per kilowatt-hour multiplied by full load amperes should be a constant, since one meter of a type is checking the range of different sizes that the transformer covers.



TEST WIRING DIAGRAM using substandard meter

•

Low-Impedance Coils Block Interference

By H. E. OVERACKER
Radio Interference Specialty Company, San Francisco, Calif.

Acting as barriers to a wide range of radio frequencies, newly developed coils having low, 60-ohm impedance afford an economically practicable means of confining the area in which the utility engineer needs to eliminate sources of interference from his system. By so winding the coils that inductance and distributed capacity are kept low, it has become possible to apply them to low- as well as high-voltage lines and at the same time maintain an effective impedance at high frequencies (up to 20 megacycles and more).

Thus two such coils per phase can be used to establish an attenuation section (or three to establish two sections) through which no appreciable interfering frequencies will pass. There are now more than 200 installations of such coils, furnished by the Radio Interference Specialty Company, San Francisco, which claims a basic patent on the use of two or more

THE KEARNEY TRIPOMATIC FUSE CUTOUT

A GUARANTEED PRODUCT

CHECK LIST of Important Things to Consider . . . .

- ☐ Switch Has Clamp-type Terminals
- ☐ Predetermined, Uniform Fuse Tension
- ☐ No Cement Is Used
- ☐ Guaranteed Trip Out Action
- ☐ Convertible to Disconnect

Look for the above features and many other advantages of Kearney time and field-tested Tripomatics when specifying cutouts.

It will pay you to investigate the safety and performance advantages of Kearney Tripomatic Cutouts — designed to give line to line flashovers which are appreciably greater than the line to ground flashovers.

As one operating man says: Why put up cutouts that might arc in open air, present a hazard and possibly burn up equipment—when you can use Kearney Tripomatics and minimize those hazards? Here's something worth asking about . . . Or, write for further information and prices.

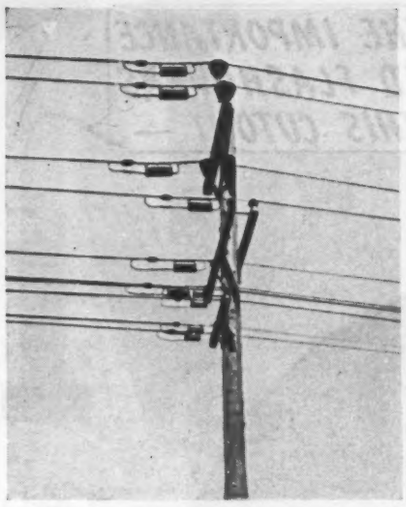
Upper contact acts as quick opening latch and, being of the point pressure type, affords uniform pressure and high conductivity.

All around, swivel type, adjustable hangers are bolted directly to the housing in order to get away from the use of cement.

You get predetermined tension on the fuse link by means of the stainless steel spring in the special tripping mechanism.

Use **KEARNEY PRODUCTS**

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE., ST. LOUIS, MO.
Canadian Plant, Toronto - Canada



TYPICAL INSTALLATION of "Risco All-Wave" coils

impedances in series on open-wire circuits for purposes of producing attenuation.

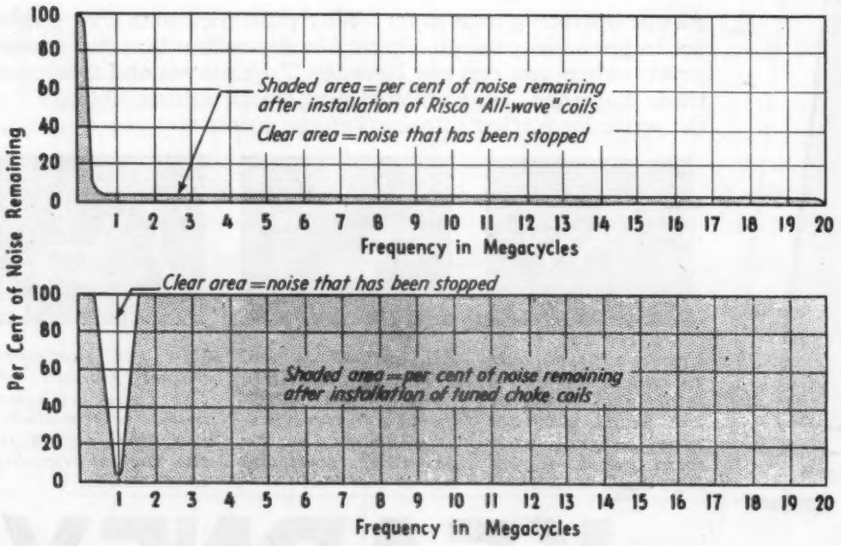
Inherent capacitance and inductance of the line is in effect part of the attenuation-section circuit. Hence coils must be carefully selected for the particular application, with consideration for size of wire in use, spacing between wires, spacing between poles, peak-load current and lowest frequency it is desired to block.

Field tests have shown that two properly selected coils per wire, forming one attenuation section, reduce noise level approximately 25 db. (15 to 1). On a three-phase line such an installation causes a 60-cycle power loss of about 150 watts with 100 amp. flowing. Three coils (two sections) yield a 50-db. noise attenuation (a ratio of 300 to 1).

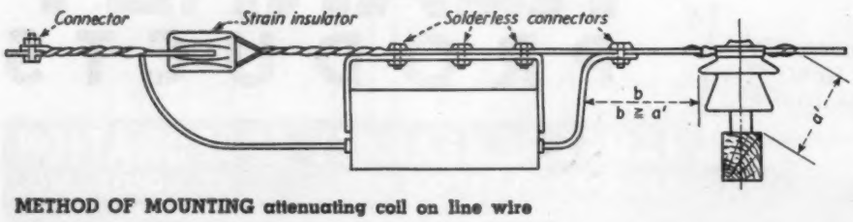
In a properly designed section tests have shown that more than 98 per cent of power at all frequencies up to 100,000 cycles will be passed, while from 500,000 cycles up to 20 megacycles less than 5 per cent will be passed. Such an installation's effect is in sharp contrast to that of a tuned coil, which is effective only within a narrow band.

The coils are installed adjacent to a pole. The line is broken with a strain insulator, the coil hung from the wire adjacent to the strain insulator, thus connected in series (usually 300 ft. apart) by means of leads provided.

By, for example, installing the coils where a line enters a town admission of noises originating on the line outside can be prevented. Interference elimination is then confined to preventing the origination of noises on the system within the town itself.


Per Cent of Noise Remaining
100
80
60
40
20
0
Shaded area = per cent of noise remaining after installation of Risco "All-wave" coils
Clear area = noise that has been stopped
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Frequency in Megacycles
Clear area = noise that has been stopped
Shaded area = per cent of noise remaining after installation of tuned choke coils
Frequency in Megacycles

COMPARISON OF NOISE passed by tuned coil and by attenuation section

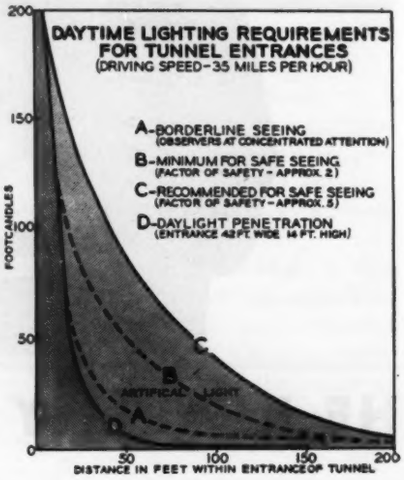


METHOD OF MOUNTING attenuating coil on line wire

Daytime Lighting of Tunnel Entrances

With the building of high-speed highways, many with tunnels, there is the problem of providing good general lighting as well as safe supplementary daytime lighting for the entrance.

The general tunnel lighting should be of the same order as that provided by good street lighting. The accompanying chart, prepared by General Electric engineers at Nela Park, shows the daytime lighting requirements for tunnel entrances. The purpose of this lighting is to give the eyes a chance to readjust themselves to comparative darkness after having been accustomed to several thousand foot-candles of daylight. Going into a theatre in the daytime is a familiar experience and illustrates the time element in eye accommodation.

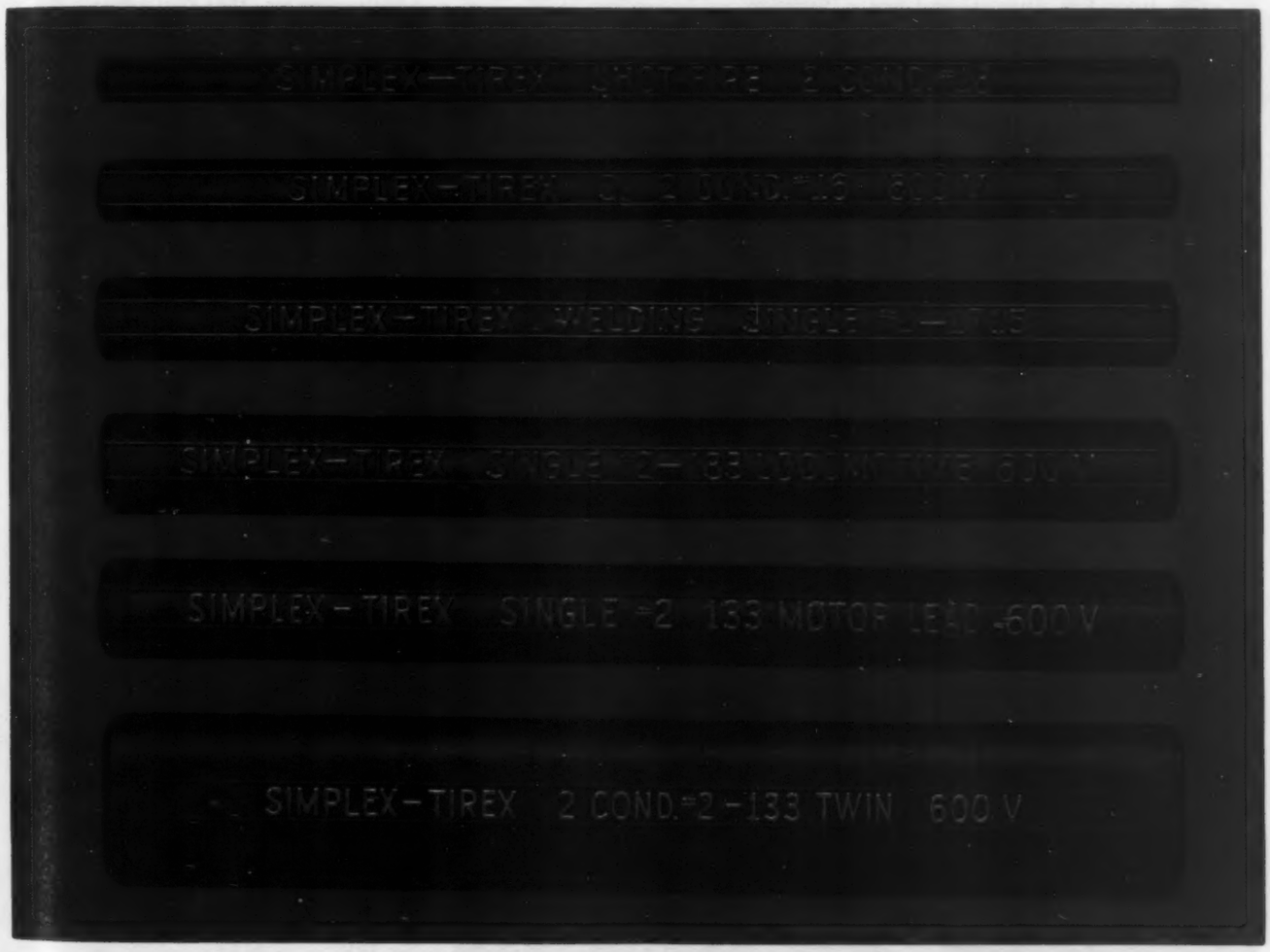

DAYTIME LIGHTING REQUIREMENTS FOR TUNNEL ENTRANCES
(DRIVING SPEED - 35 MILES PER HOUR)
A - BORDERLINE SEEING (OBSERVERS AT CONCENTRATED ATTENTION)
B - MINIMUM FOR SAFE SEEING (FACTOR OF SAFETY - APPROX. 2)
C - RECOMMENDED FOR SAFE SEEING (FACTOR OF SAFETY - APPROX. 5)
D - DAYLIGHT PENETRATION (ENTRANCE 42 FT. WIDE, 14 FT. HIGH)
FOOTCANDLES
200
150
100
50
0
ARTIFICIAL LIGHT
50
100
150
200
DISTANCE IN FEET WITHIN ENTRANCE OF TUNNEL

Commonly the supplementary daytime lighting within the entrance is artificial and, as can be seen from line B on the chart, a minimum of 100 ft.-candles should be provided within the entrance for safe seeing, this tapering down to 2 or 3 ft.-candles over a distance of 200 ft.

These values are for a driving speed of 35 miles per hour. Where the car speed is greater, the distance over which supplementary lighting is provided should be proportionately greater. For example, for cars traveling 50 miles per hour the supplementary lighting should be provided over 285 ft. to allow the same amount of time for the eyes to become accommodated to the change in lighting values.

New Markings for SIMPLEX-TIREX Rubber Sheathed Cords and Cables

These are the new markings which are put on stock sizes and types of Simplex-TIREX Cords and Cables. They are molded on the rubber sheath — not printed or stuck on — and are raised slightly above the surface so that there is no decrease in the thickness of the famous TIREX "selenium rubber armor." They not only identify the cord or cable as Simplex-TIREX but give complete identification including number of conductors, type and voltage rating. They are an added TIREX feature designed for your convenience and safety but cost you nothing extra.



Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.

Simplex-TIREX

The only cable armored with Selenium Rubber

LOAD BUILDING

Mine Electrification Pays Two Ways

Two years ago the Governor mine, 60 miles from Los Angeles, and one of the oldest gold mines in California, replaced Diesels with electric service. Southern California Edison Company built a 11.5-kv., 12-mile line to serve mine and mill, 3 miles apart.

A survey of two years' operation reveals that both company and customer have gained considerably through use of electric service.

Customer benefits: (1) Production has increased from 30 tons per day in August, 1937, to 130 today. (2) Costs per ton have decreased. (3) Abundant availability of power makes it possible to add equipment conveniently, as needed. (4) Power costs per ton can be determined accurately and conveniently. (5) Employees enjoy such benefits as hot-water showers, efficient electric safety-cap lamps. (6) The management is in a position, and is planning, to install a 15-kva. electric assay furnace, thus eliminating the expense of hauling fuel, gaining more accurate control of operation, increasing the life of crucibles and making working conditions more healthful.

Company benefits: (1) Load has increased by 178½ hp.—from 108½ to 169 at the mine, from 60 to 178 at the mill. (2) Electricity has helped make possible mine developments which assure future operation and hence continuing load. (3) Service to the mine has enabled the company to serve new rural customers from this line.

Connected Loads at Governor Mine

Mine Proper	August, 1937	August, 1939
Hoist	40 hp.	50 hp.
Crusher	15	15
Compressor	40	80
Fans	3	6
Grinder	3	3
Blower	7½	15
Total	108½	169
Mill	40	90
Classifier	5	10
Float machine	15	55
Assay shop	2	8
Well pump	7½	15
Total	69½	178

GOVERNOR MINE, California, was electrified two years ago. Benefits of the service have aided expansions which promise continued operation for many years

China Kiln Turns to Purchased Power

The squirrel-cage induction motors which operate the ventilating and exhaust fans on an oil-fired rotary kiln in the plant of the Bailey-Walker China Company, Bedford, Ohio, have been running 24 hours a day, seven days a week, since early in April, 1937, when the equipment was first started up.

The motors are all located in the inner circle around which the kiln conveyor rotates and are, therefore, unavoidably in a relatively high surrounding temperature.

Power interruptions have been few and brief in the 2½ years, totaling something less than three hours out of the more than 22,000 hours which have elapsed since operations began. Dishes are fired in a temperature close to 2,000 deg. F., but heavy kiln insulation, plus a three-part heat removal system, serve to hold the room temperature to about 110 deg. F.

One 3-hp. Reliance squirrel-cage induction motor operates a fan which introduces 5,000 cu.ft. of air per minute at room temperature into the kiln near its exit. This cools the dishes as they approach the end of their 44-hour travel through the kiln.

A second 3-hp. Reliance squirrel-cage motor operates an exhaust fan which pulls air through the kiln at the rate of 4,000 cu.ft. per minute. This is done to distribute uniformly the baking heat over the slowly moving stacks of dishes. This air is exhausted from the kiln at 450 deg. F.

The biggest motor of the three, a 7½-hp. squirrel-cage unit, operates a fan to dispose of the waste heat from the sides and top of the kiln. This fan handles 14,000 cu.ft. per minute at

WHAT ARE THESE 28 GIRLS DOING FOR YOU ?

THE twenty-eight girls in the picture below are members of Phil Spitalny's All-Girl Orchestra. Every Sunday evening at 10 o'clock (EST) they go on the air in the "G-E MAZDA Lamp Hour of Charm" to sell Better Light for Better Sight. This program reaches more than 3,000,000 families—many of them your customers—telling them about the low prices and high quality of G-E MAZDA lamps . . . and urging them to use better light for better seeing. By helping to keep empty sockets filled, this program helps sell lighting for you! You can profit by inviting your customers to hear it every Sunday evening.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Phil Spitalny's talented and lovely All-Girl Orchestra has made the "G-E MAZDA Lamp Hour of Charm" one of the most popular musical shows on the air. Sunday, NBC Red network, 10:00 P.M., EST.

MORE THAN 12,000 dishes a day are fired in this rotary kiln
The kiln is so designed that waste heat recovered is sufficient for process purposes and plant heating and has permitted shutdown of isolated plant formerly operated. Motor-driven fans are to extreme left and right and in left background; combined they move about 23,000 cu.ft. of air a minute.

around 180 deg. F., distributing it through a system of ducts to a variety of plant processes requiring heat, and to the plant heating system, 90 per cent of whose needs, even in the coldest weather, it is possible to meet from this single source.

Recapture of this waste heat, ordinarily lost to the outside atmosphere in the "milk bottle" type of kiln, has made it possible to shut down the company's own steam plant and buy electric power from the utility company in place of generating it. For the very few processes in which live steam is required a small, electrically fired steam generator has been substituted. This unit occupies only a few square feet on the surface of a work bench in the plant.

The kiln which was built for Bailey-Walker by the Allied Engineering Company, Cleveland, Ohio, is 144½ ft. in circumference, with a 22½ ft. open section for the loading and unloading of the dishes. The tunnel or firing compartment is 3 ft. high, 4 ft. wide and has 30-in. thick walls, faced on the outside with a yellow glazed brick. Daily (24 hours) capacity of the kiln is, therefore, somewhat more than 12,000 dishes.

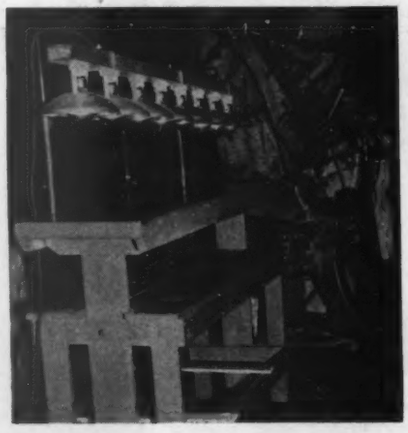
•

Infra-Red Lamps Replace Heaters

Infra-red lamps have displaced electric strip heaters for warming bakelite preparatory to punching at the plant of the Soreng-Manegold Company, Chicago. It was found that radiant heat from the lamps thoroughly penetrated the ⅛-in. thick strips and eliminated blisters formerly experienced with the strip oven. Trouble with blistering in the 1,000-watt strip oven was believed due to raising the surface temperature of the bakelite too high in an attempt to secure heat penetration throughout the cross-section.

The bench on which the bakelite is now warmed is shown in the accompanying illustration. It was built by one man in about a day's time and cost approximately $50 for material and labor. Sockets for eight 260-watt, 120-volt carbon filament infra-red lamps are provided on 8-in. centers in the standard wiring channel, although only as many lamps are operated as are needed for the length of bakelite stock being heated; usually six lamps and sometimes four are sufficient. The lamps are operated two in series across 220 volts and are mounted in 7½-in. diameter reflectors.

The wiring channel in which the lamps are mounted is supported from 7/16-in. round steel rod that telescopes in a ⅜-in. iron pipe attached to the bench and equipped with a collar and thumb screw arrangement for clamping. For the stock most commonly used a height of about 9 in. above the bakelite is sufficient to heat the strips to the proper punching temperature in less than a minute. The surface of the bench upon which the strip stock is laid has been covered with sheet steel and is about 1 ft. wide and 5 ft. long. Provision has been made for the bank of lamps and bench surface to be raised and lowered to suit the convenience of the punch operator.



EIGHT 260-watt infra-red lamps replace electric strip oven for warming bakelite strips

•

Dealers Sell 388 Units in Two Months

The monumental feat of selling 294 electric ranges and 94 water heaters in two vacation months was accomplished last summer in a co-operative dealer-utility range campaign conducted in South Bend, Benton Harbor and Elkhart by the Indiana & Michigan Electric Company.

Seventy-two per cent of the sales were completed by the 66 electrical dealers that participated in the three cities. The balance of the sales were made by the utility, which purposely inaugurated this campaign during a period when the bulk of its salesmen could give dealers as clear a field as possible. Analysis of the results shows that a range or water heater was sold to one out of every 126 residential customers of the utility during the activity, boosting range saturation to 18½ per cent, or one to every 5½ residential customers.

Incentive to aggressive selling on the part of dealer salesmen was a free trip to the All-Star vs. N. Y. Giants professional football game held in Chicago early in the fall. All expenses were paid by the utility company. Evidence that this incentive was a powerful one is the fact that some dealers who had sold six units in two years doubled their sales in the 60-day campaign. One dealers' organization in South Bend reached the campaign high of 29 units.

In order to qualify to send one man on the trip each dealer was required to sell twelve units. For each additional unit sold, and ranges were counted of equal weight with water heaters, the dealer was permitted to send one additional man to the game. Twenty-two representatives took the trip from fourteen different stores.

THERE'S NOT ANOTHER STOVE MADE LIKE THIS HOTPOINT.. SEE WHAT I MEAN?

THE ELECTRICIAN in Hotpoint's sensational new feature-length sound movie, "BLAME IT ON LOVE," puts more good old down-to-earth "sell" in his explanation of the Hotpoint Electric Range than you could ever imagine—and it's NOT high pressure. Write for information about this great promotion today!

Hotpoint Retailers Cheer!

sides the great "BLAME ON LOVE" promotion, otpoint gives you a grand w line of range models th Measured Heat, the tstanding electric cook- feature of the year.

THE NEW CENTURY
a price leader with:

- ew self-cleaning Calrod.
- ne-piece top of stain-resis- ant enamel.
- Three Select-a-Heat Calrod nits with 5 Measured Heats.
- Oversize 6-qt. Thrift Cooker.

MADE TO RETAIL AT

$99.50

in most localities

(Lamp and timer available at slight additional cost)

THE CENTURY. *A 39-inch automatic electric range with Hotpoint quality features at lowest price in Hotpoint history.*

HOTPOINT Appliance retailers from coast to coast have applauded and acclaimed Hotpoint's new feature-length sound movie, "BLAME IT ON LOVE," as the greatest electric range promotion event in appliance history.

And there is good reason for such overwhelming enthusiasm because...

- BLAME IT ON LOVE makes YOUR store the center of appliance buying in your community—develops store traffic because people come to YOUR showroom for free tickets to the big show—focuses the spotlight on YOUR store as headquarters for Hotpoint Electric Appliances.
- BLAME IT ON LOVE dramatizes, glorifies and sells electric cooking and the Hotpoint Electric Range as it has never been sold before.
- BLAME IT ON LOVE gives you the opportunity of a lifetime to tell a 54 minute uninterrupted story about Hotpoint Electric Ranges to an audience which you select yourself. Makes your selling job easier.

Plan now to lead the parade in your town! Stage the BLAME IT ON LOVE promotion. Ask your distributor for details or write

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.
5618 West Taylor Street, Chicago, Illinois

ELECTRIC **Hotpoint** RANGES

REFRIGERATORS • WATER HEATERS • WASHERS AND IRONERS • CLOTHES DRYERS • DISHWASHERS • ELECTRONICS

NEW EQUIPMENT

Electric Cooker

Designed to plug in to any convenient outlet, this appliance has not only a standard thermostatically-controlled roaster with indicating pilot light but also a full-size

"Mealmaster" with 1,400-watt roaster and combination grill and broiler unit 1,600 watts. **Electromaster Inc.**, Detroit, Mich.

combination grill and broiler. The grill and broiler are controlled by a three-heat rotary switch, identical to those used on standard ranges. The roaster is fully equipped with porcelain-enameled utensils, all said to be easily removable for cleaning. Floor space required is 21½ x 32½ in. Cooking table height is 36 in. (See ELECTRICAL WORLD, March 9, page 79.)

•

Reclosing Fuse Cutout

100-amp. reclosing fuse cutout in 5,000-volt 7,500/12,500 grounded wye volt ratings. **General Electric Co.**, Schenectady, N. Y.

This device is similar in design to the company's 50-amp. reclosing cutouts, but constructed for heavier current duty. The entire reclosing mechanism is in the door. The cutout functions by automatically connecting a second fuse link in the circuit one second after the first fuse link blows. At that time the door of the cutout is pushed open at the bottom and a red indicator appears. If the fault persists and the second fuse link blows, the door opens to a position isolating it from the circuit. Claimed to restore service after a temporary fault, even when door is frozen shut with sleet.

•

Wire Rope Clip

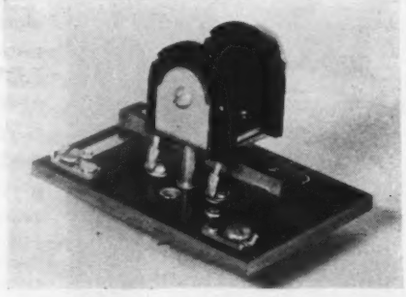
Wire rope "Safety" clip. **Thomas Laughlin Co.**, Portland, Maine.

This new clip contrasts with the "U-bolt" clip, which has both nuts and a single flat bearing surface saddle on one side, in that bolts and identical bearing surfaces on opposite sides equalize the pressure on the rope.

•

Remote Control Relay

These new type relays are designed for general control purposes, insulated for radio frequencies and high voltages, and available for many a.c. and d.c. voltages. A large shading coil and other features



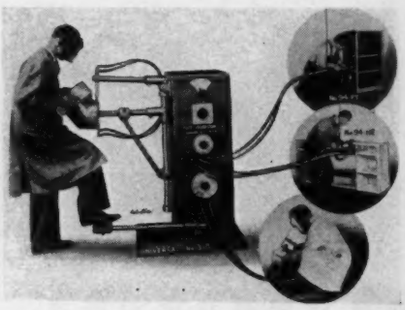
Remote-control relays, series RB and RM, RBA-1 (shown); operates on 110 volts a.c. **Standard Electrical Products Co.**, St. Paul, Minn.

incorporated in the design of the magnetic path are said to eliminate a.c. chatter. The armature pivots on two ball bearings, said to give freedom of motion to the "floating" armature.

BUYING ELECTRICAL EQUIPMENT?— "Electrical World" *Electrical Buyers Reference* is a convenient place to look first for names, addresses and products of manufacturers.

Spot Welding Machine

This new type of spot welding machine is similar to a standard 10-kva. spot welder with sliding horns and is especially adaptable for all kinds of sheet metal



Universal spot welding machine No. 310. **Eisler Engineering Co., Inc.**, Newark, N. J.

work. The new features on this machine are that one machine will spot weld, push weld, gun weld and arc weld. It embodies the conventional type spot welding machine, foot operated; a.c. transformer type arc welding machine; hand-operated push spot welder, and air-operated gun welder. The machine is supplied with individual controls so that each operation can be performed without interfering with the other.

•

Heater

Special flange head oil immersion heater for particular use in high-pressure systems. **Westinghouse Electric & Mfg. Co.**, Mansfield, Ohio.

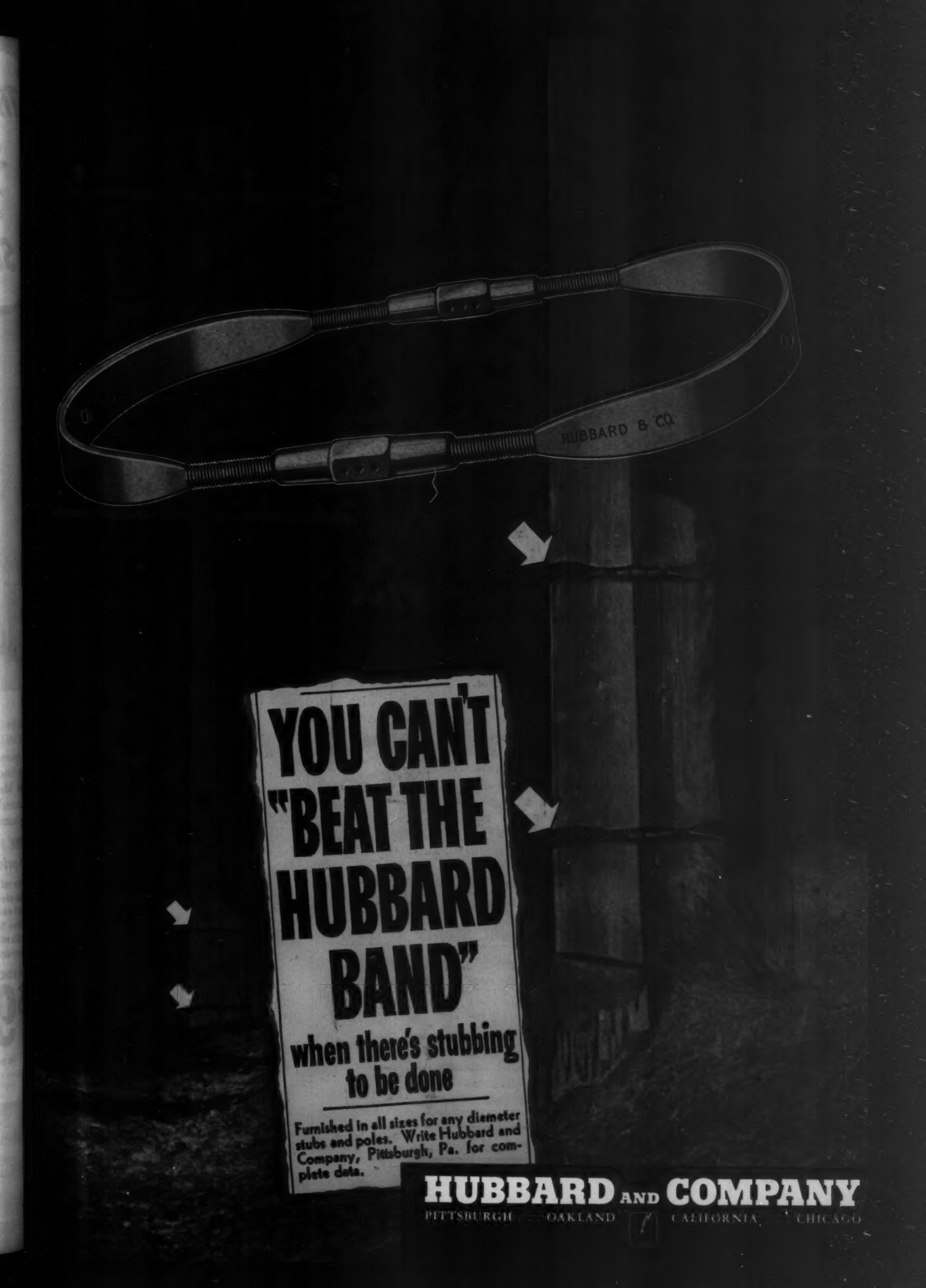
The heater tubes are of steel, silver soldered into a cast-iron head, and the units are made for both circulating and non-circulating systems. The non-circulating heaters have a rating of from 1 to 3 kw. for 115 or 230 volts with two heater tubes. The circulating heaters have a rating from 5 to 8 kw. for 230 volts with two- or four-heater tubes.

•

Fluorescent Lamp

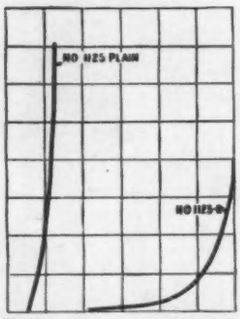
Clamp-on fluorescent lamps for desks, drafting tables, work benches, etc., No. FL 723 and FL 722. **The Miller Co.**, Meriden, Conn.

No. FL 723 is a double-arm fluorescent lamp for drafting tables, factory work


HUBBARD & CO.
YOU CAN'T "BEAT THE HUBBARD BAND"
when there's stubbing to be done
Furnished in all sizes for any diameter stubs and poles. Write Hubbard and Company, Pittsburgh, Pa. for complete data.
HUBBARD AND COMPANY
PITTSBURGH OAKLAND CALIFORNIA CHICAGO

They no longer hiss the Maestro

PROOF!



Performance curves of Pinco plain and "NO-CORONA" Nos. 1125, 1125R 45KV One-Piece Insulators.

There's a friendlier feeling for the power company today in the homes of one community's music lovers. "NOCORONA" quieted lines have ended the disturbing hissing that seemed always to greet the lifted baton of their favorite radio symphonic conductor.

"NOCORONA" Quiet Insulators with "fired in" radio proofing* exceed the highest specifications for radio noise reduction . . . have in addition the enduring qualities of standard Pinco Insulators. Distributed through THE JOSLYN MFG. & SUPPLY CO. and affiliates.

PINCO INSULATORS

*10 YEARS ON THE FIRING LINE

THE PORCELAIN INSULATOR CORPORATION, LIMA, N. Y.

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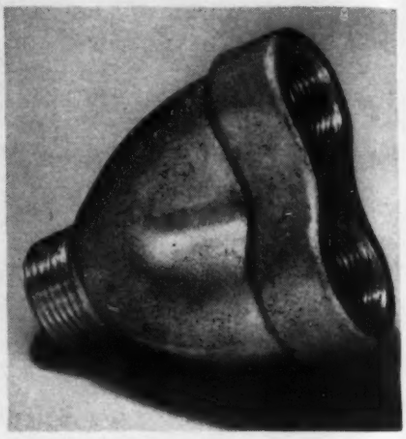
ELECTRICAL WORLD 330 W. 42nd St. N. Y. C.

benches and similar locations. It is adjustable at three points to provide flexibility. For operation on 110-125-volt, 60-cycle a.c. circuits, using 15-watt T-8, 18-in. lamp. No. FL 722 is a single-arm lamp for typewriter desks, bookkeeping machines, etc. Adjustable at two points. Has same rating and uses same bulb as the No. FL 723.

•

"Y" Fitting

A device developed for use in changing over old-style services to new sequence outdoor metering for either the socket



"Y" fittting for C-B meter inclosures. Corcoran-Brown Lamp Division, Electric Auto-Lite Co., Cincinnati, Ohio.

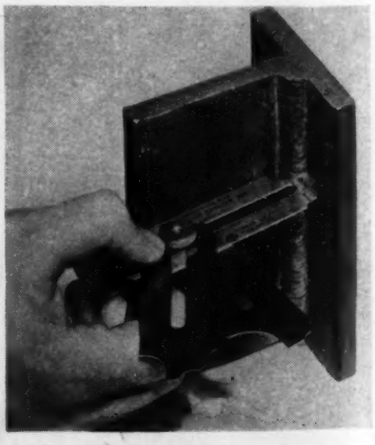
•

meter or meter cabinet. It is especially adaptable on socket meters, bringing the line down through one side of the Y fitting and taking it back to the original point of entry on the other side. The same method is used with a meter cabinet.

•

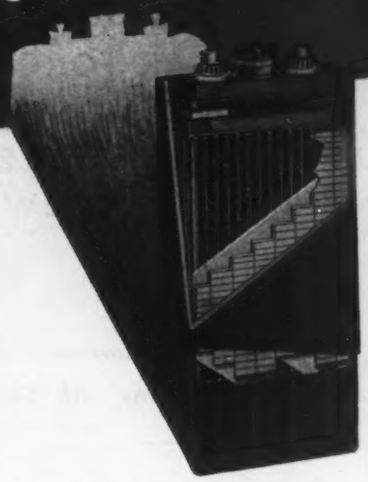
Fillet-Weld Gage

For checking the size of fillet welds on jobs, this gage is of simple design, consisting of three stainless-steel stampings held together by a bolt and knurled thumb-nut. Either convex, concave or standard fillets can be checked by fitting the edge of the



Fillet-weld gage to be used on fillets of the following sizes: 5/16 in., ⅜ in., ¼ in., 5/16 in., 7/16 in., ½ in. and ⅝ in. General Electric Co., Schenectady, N. Y.

MORE AND MORE BUYERS ARE LOOKING BACK OF THE PRODUCT WHEN THEY BUY



MOST storage batteries look very much alike—on the outside. With jars of black rubber and painted trays of wood or steel, even Exides look very little different from others. And if Exide develops a new size or type, such as the TLM, the ML, the FLM, and the MEH types, it is not many months before other manufacturers have a size to meet the Exide rating.

But what really matters are the things you seldom see—what is inside a cell, and what is back of the product.

Inside an Exide-Ironclad cell you will find a real difference. The construction of an Exide-Ironclad positive plate is unlike that of all others in this country. The active material of the plate is contained in hard rubber tubes slotted horizontally to permit free access of the electrolyte. 12½% more plate surface is exposed to the action of the electrolyte than in the regular flat pasted plate construction of the same dimensions.

This is but one advantage. The active material is so firmly held in place and its loss so greatly retarded that the Exide-Ironclad delivers two to three times the life of a battery with ordinary plate construction. All the inherent advantages of the regular type of lead battery are fully retained—its high power ability, high electrical efficiency, and low internal resistance, with great ruggedness and dependability in addition. Only the Exide-Ironclad can give you all these advantages.

Looking further, you see the company behind the battery, a company that is one of America's great institutions. Started 51 years ago with a small plant and an organization of five men, it consists today of vast factories with many acres of floor space and of assembling plants in principal cities the country over. It is a company grown to be the largest of its kind in the world because of the genuine merit of its products and its reputation for fair dealing.

It has always been devoted exclusively to the manufacture of one product—storage batteries—and its foundation policy has been to build its product for each class of service with the full measure of excellence that its long experience and ample resources could provide.

Behind the product also is a nation-wide service organization, which does not wait for you to call on it, but makes regular and frequent visits to plants in which Exides are used, with the purpose of insuring you the utmost in performance and the longest possible life from the battery.

Today, more and more buyers are looking back of the product before they buy. That is why more and more buy Exide. When you need a battery, don't base your selection on outside appearance only. Look behind it as well as inside—and you, as have thousands of others, will see why your new battery must be an Exide.

Exide
IRONCLAD
BATTERIES

With Exide **MIPOR** Separators
"MIPOR," Reg. U. S. Pat. Off.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

IF IT'S A PROBLEM IN

Emergency Rebuild—

BEYOND THE CAPACITY OF YOUR REGULAR FORCES, WE OFFER COMPLETELY EQUIPPED, EXPERIENCED CONSTRUCTION CREWS.

◆

We Welcome an Opportunity to Discuss Your Problems with You.

R. H. BOULIGNY, INC.

Contractors—Engineers

CHARLOTTE, NORTH CAROLINA

POWER *To Bend it*

EASIER AND FASTER

The man on the job will like the Greenlee Hydraulic Bender because he can easily develop the hydraulic pressure needed to bend the pipe, by simply pumping the handle. And you'll like the Greenlee because it will save you money, both on labor and material costs. You'll save money on labor costs because the operator can do the job much easier and faster with the Greenlee, and you'll also eliminate the cost of many manufactured bends and fittings.

Yes, you'll agree along with hundreds of other users in the country that the Greenlee will more than pay for itself on the first few jobs. The more your men use the Greenlee Bender the more they will like it, and the more they use it the more money you'll save. And remember, too, that after the first few jobs this money is profit in your pocket!

WRITE FOR COMPLETE DETAILS

The Greenlee Hydraulic Bender shown above is made in two sizes for conduit from 1¼ to 3-inch and from 3 to 4½-inch.

GREENLEE TOOL CO. 1705 Columbia Ave. ROCKFORD ILL.

gage flush against the work so that the indicating portion of the gage rests on the weld bead.

•

Capacitor

A capacitor designed for fluorescent lamp power-factor correction. **Aerovox Corp.**, New Bedford, Mass.

Power-factor correction capacitors of the oil-filled paper type to be included in the fixtures as initial built-in equipment, or may be added subsequently. Insulated wire terminals are at one end. Mounting feet permit flat mounting. Three types are available, taking care of twelve standard types of fluorescent lamps in general use.

•

Electric Stopwatch

Instead of the conventional watch dial, this device utilizes an indicating counter. Readings from 1/10 second to 10,000 seconds can be read and the counter can be

"Time-It;" electric stopwatch for 60 cycles, 110 volts. Measures 4 x 5 in. x 3½ in. **Precision Scientific Co.**, 1750 N. Springfield Ave., Chicago, Ill.

reset to zero from any reading by means of a reset knob. Stopping and starting are controlled by a fingertip push button. Motor mechanism is equipped with a built-in brake to eliminate "coasting" when stopping the timing operation.

•

Watt-Hour-Demand Meter

Type "WDE" watt-hour-demand meter combination. **Sangamo Electric Co.**, Springfield, Ill.

This combination unit, announced in ELECTRICAL WORLD for March 23, 1940, is housed in a polyphase type case with single-phase terminal chamber.

•

Reset Timing Relay

Reset timing relay with cycle progress indication; two models, one with cycle range from 0-120 seconds, the other with cycle range from 0-20 minutes. **Eagle Signal Corp.**, Moline, Ill.

Designed for industrial machinery processing applications, it is synchronous motor driven and has a s.p.d.t. switch for external control. The switch has ⅛-in. diameter silver alloy contacts, which are said to be capable of handling large loads, thus eliminating, in many applications, the use of contactors or relays. The motor

KITTY: "Why did Dad talk to me like that, Mom—I didn't do a darned thing."

MOM: "I know, Kitty honey, your dad's upset because the water heater is actin' up again. That's why I'm heating water for Gramp's hot water bottle."

DAD: "You say all I have to do is install the G-E and forget it. That sounds too easy to be any good. What's the catch?"

SALESMAN: "There is no catch, Mr. Dugan. If you'll step over to the chart, I'll show you."

MOM: "Well, of all things—that's Gramp singing in the bath tub!"

GRAMP: "She'll be comin' round the mountain when she comes. She'll be wearin' red pajamas when she comes. She'll be drivin' six white hosses . . ."

See *This DRAMATIC NEW*

G-E WATER HEATER PICTURE!

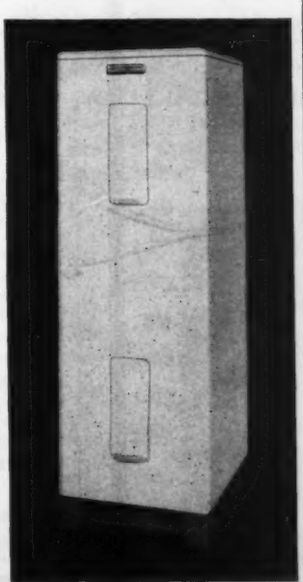
The General Electric Water Heater line is *complete.* Sizes for every need—from 2 to 140 gal. capacity. Rectangular, round, table top, wall type models. Monel or galvanized. Single or twin units.

●

All G-E Water Heaters have the famous

CALROD

immersion type heating units. Calrod heats water by direct contact, cheapest electrical method known. Durable, trouble-free. Will not scale or rust.



JUST ONE OF THE MANY NEW G-E WAYS TO MORE WATER HEATER SALES

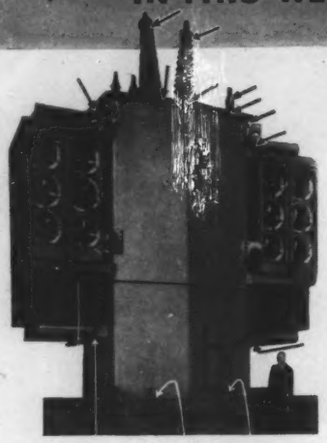
Your G-E Appliance Distributor has something *red hot* to show you! It's General Electric's new full length sound slide film "We Like It Hot!"—and it's a *"natural"* for water heater sales. See it—and you'll see why! And see General Electric's many other new "props" and plans to get more water heater business . . . .

1. A big, new, profusely illustrated Sales Presentation Book. **2.** A new and entirely different Sales Manual in which interesting pictures take the place of dry text matter. **3.** A new Wall Display Chart and Visualizer. **4.** The new and novel G-E Heater-Meter. **5.** And the sensational new film "We Like It Hot!" Phone your G-E Distributor NOW and *see for yourself.*

GENERAL ELECTRIC COMPANY, APPLIANCE AND MERCHANDISE DEPT., BRIDGEPORT, CONN.

GENERAL ELECTRIC

Corprene KEEPS JOINTS DRY IN THIS WESTINGHOUSE TRANSFORMER



Arrows show where dependable gaskets of Armstrong's Corprene DC-116 stand guard in this 65,000 KVA, 287,500 volt Westinghouse Auto Transformer, built for the City of Los Angeles at the receiving end of Boulder Dam Transmission.

IN equipment such as this mammoth Auto Transformer, Westinghouse uses gaskets of Armstrong's Corprene wherever there is exposure to outside atmosphere, and wherever a permanent, *sure*-seal is required.

Corprene is a "natural" for sealing jobs in transformers, circuit breakers, switches, and other electrical equipment. It is practically unaffected by corona or sunlight. It is impervious to liquids and gases and highly resistant to their destructive effects—and thus is ideal for oil-filled units.

Most important to you—if you have a sealing problem—is the fact that there are more than *two dozen* Corprene compositions, each having different physical characteristics. Since Corprene is made by combining cork with various kinds of synthetic rubber, it can be fabricated so as to effect just the proper relationship of compressibility and lateral flow, for example, that is desirable for a specific application. If you'd like samples, tell us your needs. Armstrong Cork Co., Industrial Division, 908 Arch St., Lancaster, Pa.

ARMSTRONG'S *Corprene*

COMPOSITIONS OF CORK AND RUBBER-LIKE MATERIALS

Hot Rolled Copper Rods • Bare and Tinned Strand

Bare and Tinned Copper Wire

(In Rounds, Flats and Squares)

URC Weatherproof Wire

Cotton, Paper and Asbestos Magnet Wire

(In Rounds, Flats and Squares)

Rubber Insulated Wires and Cords

Lead Covered Cables • Multiconductor Power Cables

Network, Service Entrance, Control Cables

ROME-60

That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

ROME CABLE

CORPORATION

ROME, N.Y.

SALES OFFICES:

New York Chicago Cleveland Pittsburgh Detroit
Boston Richmond Philadelphia Los Angeles

used is of the slow-speed type and consumes 5 watts. This device features a large clock face dial. An adjusting knob may be used for adjusting timing intervals.

•

Resistor

General-utility voltage-dropping resistors, Series HT, from 100 watts up. **Clarostat Mfg. Co., Inc.**, 285-7 N. Sixth St., Brooklyn, N. Y.

This unit may be used for operation of 110-volt equipment on 220-volt supply, for the dimming of photo-flood lamps, for the operation of soldering irons and electric motors, etc. It is housed in a 3-in. diameter perforated metal shell 4½ in. long with mounting feet.

•

TECHNICAL LITERATURE

CARBON—Explains the physical and electrical characteristics of brush carbon, correlates these properties with service requirements encountered under a variety of conditions, and is a technical treatise on carbon application generally. Catalog No. 50 available from Becker Brothers Carbon Co., 3450 South 52d Ave., Cicero, Ill.

MERCURY-VAPOR LIGHTING—In addition to describing mercury-vapor transformers for indoor and outdoor applications, it explains concisely the characteristics of mercury-vapor lighting, the various types of lighting systems for specific and general applications. It may be used as reference material for determining the proper lighting system for a plant, as it includes calculating tables and charts, which, used to basic rules established, predetermine the necessary amount of light for various type buildings and work. Entitled "Light for Work," it may be obtained from Acme Electric & Manufacturing Co., Cuba, N. Y.

MAINTENANCE HANDBOOK — "Handbook of Building Maintenance," offered by Flexrock Co., 2397 Manning St., Philadelphia, Pa., presents 69 pages of information for plant engineers and maintenance men. Maintenance of floors, roofs and concrete structures are considered. Pictures, diagrams and drawings illustrate a variety of ideas to save time and materials on odd jobs.

MANUAL—270 pages containing tables and data for electrical engineers, contractors and wiremen. Among its contents the following are dealt with: Description and uses of wires and cables; bare cable; rubber-insulated cables; impregnated paper-insulated cables; series lighting cables; current carrying capacities; cable engineering data, and miscellaneous tables. Simplex Wire & Cable Co., 70 Sidney St., Cambridge, Mass.

FARM WIRING HANDBOOK—A new farm wiring handbook, 28 pages and illustrated, available on request from General Electric Company, Bridgeport, Conn. The handbook is a guide for planning electrical wiring on farms that will make for more efficient and convenient use of power and it covers the requirements of the average farm. Charts, tables and various elements to be included in specifications are included.

MANUFACTURING - MARKETS

Westinghouse Shows Orders Gain of 30%

Orders booked by Westinghouse Electric & Manufacturing Co. during the first three months this year were more than 30 per cent higher than during the same 1939 period, George H. Bucher, president, told stockholders at their annual meeting last week in East Pittsburgh. Orders totaled $65,250,000, against $50,121,000.

The company's backlog of unfilled orders was approximately $83,000,000 on March 31, a peak figure for the company. Inventory was about $66,000,000 on that date, against $53,840,000 a year ago, at which time unfilled orders were $46,900,000.

Mr. Bucher said that although complete figures were not available, preliminary estimates indicate that net earnings will be appreciably higher than the first quarter last year.

"Good business so far in 1940 has been well sustained," he said. "March continued to show an increase over the previous month. The improvement in business was well spread over our various types of customers." Mr. Bucher said that foreign business was up about 33 per cent, virtually none of it with belligerent nations.

"Especially interesting is the increased purchasing here by public utilities. Sales to central stations were more than 50 per cent higher in the first quarter of 1940 than in the same quarter last year." Purchases by industrial concerns were notably increased. Sales of household appliances were up about 12 per cent.

•

Expands Plant Facilities

Announcement has been made that the Mueller Electric Co. is now building an addition to its present factory in Cleveland. The new plant, with 6,000 sq.ft. of floor space, will help to speed up manufacturing operations and will enable the company to increase production. The most modern equipment is being installed for the efficient handling of heavy materials.

•

General Electric Given Utility Generator Award

Western Public Service Co., Scottsbluff, Neb., has awarded a contract to General Electric Co., Schenectady, N. Y., for a 2,500-kw. turbine-generator unit and accessories for installation in new steam-electric power station near First Avenue, South Scottsbluff, on which work is now under way. An award for installation of equipment, piping, etc., has been made to the Stearns-Roger Manufacturing Co., Denver, Colo. Entire project is estimated to cost close to $300,000.

•

Moves District Office

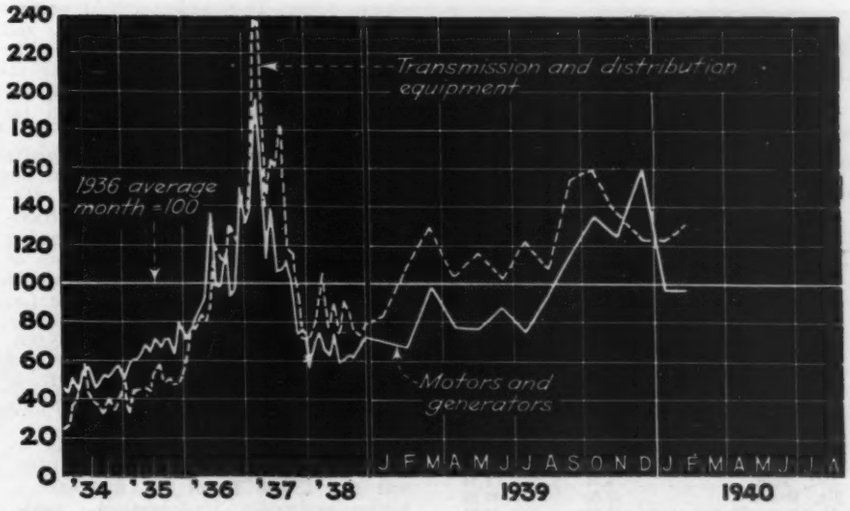
Century Electric Co., with headquarters in St. Louis, Mo., announces its Chicago district office is now located in the Igoe Building, 600 W. Van Buren Street.

Electrical Orders Increase in Month

Orders received both for transmission and distribution equipment and for motors and generators showed increases in February over January and over February a year ago, according to the NEMA indices.

For the first-named class of equipment the index rose to 131.8, a gain of 8.7 per cent from January and 21.7 per cent above February, 1939. The gain over the previous month compared with a corresponding increase for February over January of 33.5 per cent in 1939 and of 13 per cent in 1938.

In the case of motors and generators the index leveled off, after a decline in January, at 97.9; this mark was 0.6 per cent above January and 44.3 per cent higher than February of last year. The gain for February over January compared with a decrease of 2 per cent during the corresponding period of last year and with an increase of 23.3 per cent in 1938. For both equipment groups, the February, 1940, mark was the highest, save for 1937, of any February since the index was started in 1934.



NEMA INDEX, value of orders received for motors (large d.c., polyphase, synchronous) and generators (engine, belt-driven); also for transmission and distribution equipment

Manufacturers Make Sales Appointments

G. E. Booth, manager of the St. Louis district office of Cutler-Hammer, Inc., announces that E. F. Meyer is now in charge of the company's Houston territory with headquarters in that city. Mr. Meyer joined Cutler-Hammer shortly after leaving school. After serving in the experimental and testing departments in Milwaukee, he joined the Milwaukee district sales staff as a sales engineer and from there went to the St. Louis territory.

Oliver Iron & Steel Corp. has announced the appointment of Joseph H. Beaty as its exclusive pole line hardware district sales representative in the states of Alabama, Georgia, Tennessee and northern Florida with headquarters at Birmingham, Ala. For the past twenty years Mr. Beaty has been identified with the sales and engineering departments of both Westinghouse Electric & Manufacturing Co. and Wagner Electric Corp.

•

Phelps Dodge Develops New High-Voltage Cable

Phelps Dodge Copper Products Corp. has developed a new type of paper-insulated high-voltage cable, known as Habirshaw "Titebilt" cable, according to Wylie Brown, president. The cable is the result of more than five years of intensive research and experimental work in the laboratories of the Habirshaw Mills of the corporation, at Yonkers, N. Y.

The new cable is expected to be of great interest to utility companies for it will add greatly to the reliability and increase the service life of high-voltage electric power cable, it is declared. "Titebilt" cable is insulated in an improved manner with oil-impregnated paper which undergoes cyclical expansion and contraction with the daily variations of the power load.

•

Spends $500,000 on Exhibit

General Electric Co. will spend approximately $500,000 in presenting its 1940 edition of its exhibit at the New York World's Fair, according to H. H. Barnes, Jr., commercial vice-president.

New York Metal Prices

	April 16, '40 Cents per Pound	April 10, '40 Cents per Pound
Copper, electrolytic	11.50*	11.50*
Lead, A. S. & R. price	5.10	5.00
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc, Spot	6.14	6.14
Tin, Straits	47.00	47.25
Aluminum, 99 per cent	19.00	19.00

*Delivered Connecticut Valley.

Field Reports on Business

Signs of spring activities are becoming more pronounced, with utilities speeding up construction plans. Manufacturers report record backlogs of orders and production schedules geared to higher volume. Orders are showing some expansion, with a diversified line of products in demand. Outlook is favorable.

NEW ENGLAND

Orders now being received in the New England territory are well diversified; one switch and control orded placed by a well-known representative last week for approximately $3,000 for service line extensions in navy yards followed similar orders placed during the past month. Belmont, Mass., has purchased a "Polatrol" unit for street lighting and water heating control, and Manchester, N. H., recently purchased six sodium-vapor units for installation at traffic circles. One of the largest orders for sodium-vapor units was received a fortnight ago by Westinghouse and consists of 150 180-watt units to be used at the Cape Cod Canal; this company has also furnished 56 similar units for canal bridge lighting.

Interest in the use of infra-red rays for industrial processing is gaining in this territory. A short time ago the Chelsea Clock Co., Chelsea, Mass., installed a battery of lamps for rapid drying of enameled surfaces. Specifications for a 1000-kw. electric heat-treating furnace are in the hands of manufacturers in this district and an award is expected soon. The Stanley P. Rockwell Co., Inc., Hartford, has obtained an order from the War Department for an automatic conveyor type furnace for $22,500.

New England March building contracts were up, totaling more than 100 per cent above the February level. The annual New England Hotel Exposition was held at the Hotel Statler, Boston, April 17-19. More than 100 exhibitors have reserved space for their displays, among which electrical appliances have a prominent part.

CHICAGO

Some signs of a spring rise in industrial production were more in evidence last week, lending further encouragement to the outlook for the second quarter. Activity in the steel mills in this district rose slightly, with expectations of continuing improvement. The continued cold weather has adversely affected retail business and building construction. The outlook in the residential building field is extremely favorable, however, with a comparatively large number of projects scheduled for early construction.

Work on utility construction projects continues at a high level throughout the Middle West. Manufacturers report substantial orders for generating and transmission equipment, one company showing an increase in sales to central stations of 50 per cent for the first quarter this year over 1939. Louisville Gas & Electric Co. announced a $2,000,000 expansion program which will include installation of a 25,000-kw. turbine, switchyard apparatus and other equipment. Wisconsin Electric Power Co. will build a substation addition for increased capacity.

The city electrical department has requested bids on 350,000 ft. of No. 8 1,500-volt and 25,000 ft. of No. 8 5,000-volt, rubber-insulated, lead-sheathed cable. Street lighting repair work will necessitate the use of 150 new steel poles and 2,000 lampholders. Central-plant air-conditioning systems installed during the first quarter registered an increase of 35 per cent in number and 130 per cent in capacity over the same period last year. Dealers sold 44 electric room coolers, as against fourteen in the comparative period.

NEW YORK

Business in this area has shown some expansion. Some heavy orders have been placed as utilities drive forward with their construction programs. Electrical manufacturers report substantial gains in orders received and net earnings. Westinghouse orders are up 30 per cent over the first quarter last year. Backlog is the highest in the company's history. Employment is higher and payrolls for the company are likely to reach $95,000,000 this year. General Electric is optimistic over the outlook and its backlog of orders is the largest in its history.

Electrical utilities are closely watching the power curve as an indication of just how much to speed construction work planned for this year and next. Better outside working weather is at hand and the effect is being felt. Several new plants are scheduled to go into operation this summer to augment present power capacity.

Attempts to meet the SEC's show cause orders for integration are proving difficult and there are prospects that a court test is in the making. Utilities find it difficult to split up their systems without injury to the whole.

PACIFIC COAST

Despite contrary predictions, Pacific Coast building permits are increasing in value and March broke a ten-year record for the total of seven Western states. The figure was $33,721,299, which is 11 per cent better than March last year and 35 per cent better than February, 1940.

Electrical business in all branches is good throughout the Pacific Northwest and California lumbering districts. Major privately-owned construction includes several new stations for Southern Pacific and new Pacific Tel. & Tel. buildings; $1,000,000 office building for Sacramento, whose $7,000,000 army air supply base is now operating and $750,000 for a group of retail stores and an amusement center in Los Angeles.

Recent interesting orders have included a $247,150 award for three General Electric 36,000-kva. transformers for Grand Coulee unit L3; $164,452 for 200 miles REA distribution lines in Lewis County, Washington; $121,912 for a transmission line from Ampere substation of Bonneville plant to Aluminum Co. of America plant near Portland, and brisk and varied buying by government agencies ranging from pole line hardware for Alaskan air bases to wiring supplies for army central stock at San Francisco. Warmer weather and renewed confidence through unexpected circulation of building money have improved the retail appliance business and encouraged wholesalers to expect rather earlier reorders than had been anticipated.

". . . men interested and happy in their work . . . men with homes and children and bank accounts and ideas and ambitions."

BESIDES THOSE you may have put in circulation to emphasize this intensified public utility spending, ELECTRICAL WORLD, starting at the White House, sent letters and "dollars" to every U. S. Senator and Congressman and to every State Governor; to trade associations, Chambers of Commerce and to state commissions.

Typical of the daily encouragement that is being received is this comment by Congressman John M. Robsion of Kentucky:

"This brings graphically to the attention of the American people the very large contribution that the electrical utilities of the United States are making to the American dinner pail."

✳ **ELECTRICAL WORLD, 3000 McGraw-Hill Bldg., New York, N. Y.**

(If you are already a subscriber to Electrical World, you will automatically receive the "605-Million Dinner-Pail-Dollar" Issue, June 1, 1940 without extra cost. But if you want extra copies, we suggest you make your reservation now. Use the handy coupon!)

( ) ★ Please reserve.....copies at $1.00 each, postpaid, of the Annual E. E. I. Convention Number of Electrical World telling the dramatized story of "605-Million Dinner-Pail-Dollars." Please send my copies and bill to me at the address indicated in this coupon.

( ) ★ Please enter my subscription to Electrical World for one year, with the understanding that the Annual E. E. I. Convention Number of Electrical World, June 1, 1940 — the "605-Million Dinner-Pail-Dollar" Number — will be included without extra cost to me. Please bill me for 52 issues at $5.00 — (annual subscription price U.S.A.)

( ) Please send me a Dinner Pail Dollar.

My name ..... Title.....

Company .....

Address .....

City and State 4-20-40

NEWS ABOUT PEOPLE

J. R. Stevenson to Succeed Mark Eldredge in Memphis

J. R. Stevenson became director of the electric division of the Memphis (Tenn.) Light, Gas and Water Department, succeeding Mark Eldredge, resigned. Mr. Stevenson joined the city electrical engineering staff in 1937 to design the substations of the electric system the city was building. He was until his election to this new position chief system engineer for the electric division.

Following graduation from the University of Illinois, Mr. Stevenson joined the General Electric Co., and after two years entered the utility field as manager of the public utilities, gas and electric, in his home town, Monmouth, Ill., where he remained twelve years. Subsequent connections followed as general superintendent of the utilities at Kewanee, Ill.; chief engineer for the Kentucky Power Co., Maysville, and transmission and distribution superintendent for United Public Service Co., operating in several western Ohio and eastern Indiana towns. Then he was appointed superintendent of production for Community Power & Light Co. He was consulting engineer in St. Louis when he joined the Memphis electrical staff.

Mr. Eldredge was formerly chief engineer of Memphis Power & Light Co. for a number of years until the city took over the utility property last year. At that time he was made director of the electrical division. Mr. Eldredge said that he would remain in Memphis for the present, but did not announce his future plans.

•

▶ EDWARD P. CONNELL, treasurer of the Falk Corp., Milwaukee, assumes the newly created position of general manager. WALTER L. SCHNEIDER succeeds Matthew A. Carpenter as sales manager in charge of active sale of all Falk products except those covered by the foundry division. Mr. Carpenter, who is secretary of the Falk Corporation, will continue in a supervisory capacity over the sales, sales promotion and advertising departments.

•

D. C. Prince Heads G.E. Commercial Engineering

David C. Prince of Philadelphia, since 1931 chief engineer of the switchgear department of the General Electric Co., has been named manager of the commercial engineering department, succeeding the late vice-president E. W. Allen. Mr. Prince has also been named a member of the company's advisory committee and the apparatus sales committee. He will make his headquarters in Schenectady.

Bachrach

His early experience with General Electric was in the testing and railway engineering departments. He left to join the Illinois Utilities Commission. Returning to General Electric in 1919 as an assistant to Dr. E. F. W. Alexanderson, then specializing in radio development, he subsequently was assigned to the research laboratory, later became research engineer of the switchgear department at Philadelphia and in 1931 was named head of the engineering department, the position he held until his present promotion.

Mr. Prince is the holder of 73 patents and was one of eight General Electric engineers recently selected as "Modern Pioneers of Industry" by the National Association of Manufacturers. He is credited with many valuable contributions to the art of electric ship propulsion, welding, vacuum tubes, mercury arc rectifiers, electric locomotive design, and more recently in oil and air circuit breakers, including the superspeed breakers built at the Philadelphia works for Boulder Dam.

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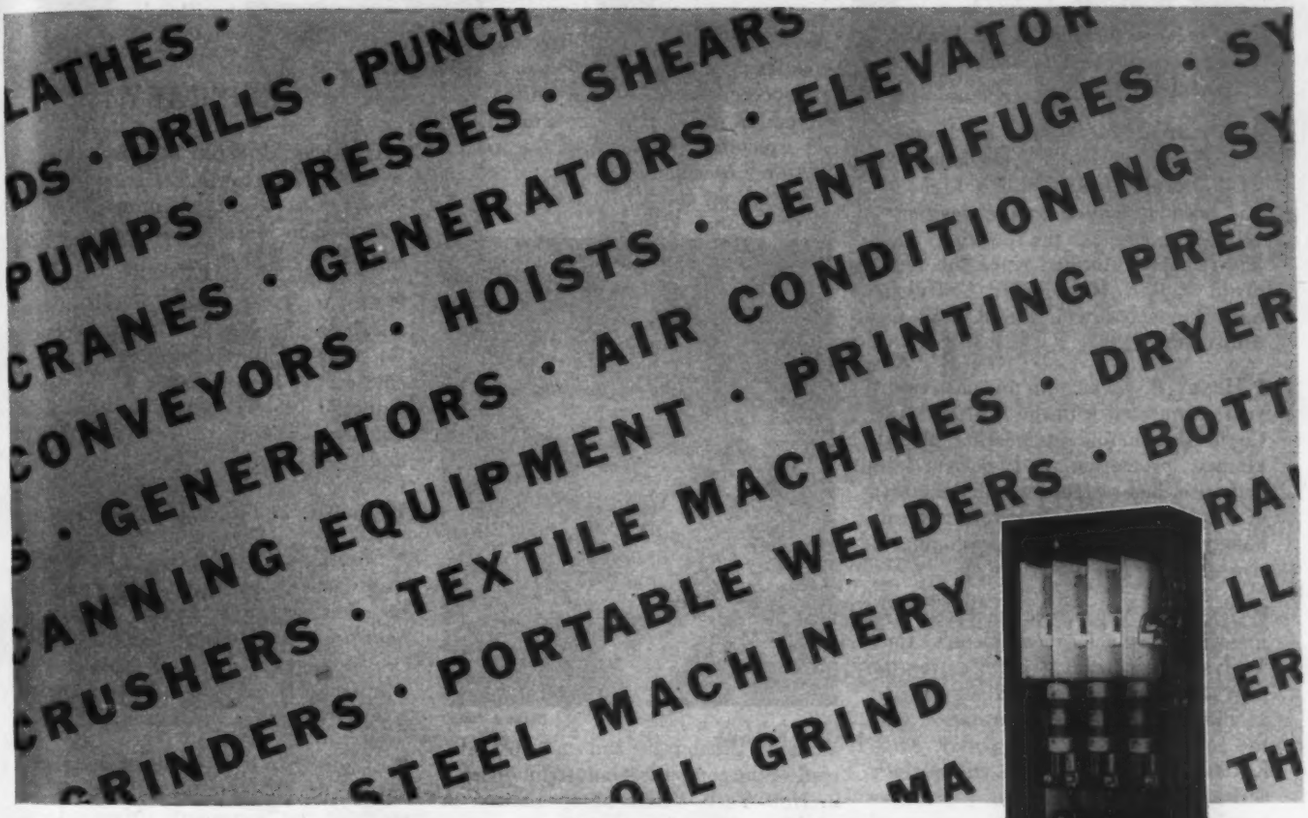
▶ F. J. LEERBURGER, recently appointed principal valuation engineer for the New York State Public Service Commission, has opened his own office in New York, N. Y., as a practicing consulting engineer.

▶ P. T. LAGRONE, division manager of the Mississippi Power & Light Co. at Greenville, Miss., has been elected by the Greenville City Council as a member of the Municipal Port Commission.

▶ C. ALLAN HART, who has been assistant general counsel for the Bonneville administration since last August, has been named acting chief counsel to succeed Herbert S. Marks, who recently resigned to enter private practice in New York.

▶ OLIVER R. EVANS, division superintendent of Pacific Gas & Electric Co.'s Stockton division, has been transferred to the position of assistant general superintendent of the San Francisco and East Bay divisions. General superintendent of these divisions is W. G. B. Euler, whose duties were extended to include those of chief engineer. Mr. Evans has been with the company since 1909 and has been division superintendent at Stockton since 1930. To take over

IF IT'S MOTOR DRIVEN


LATHES
DS · DRILLS · PUNCH
PUMPS · PRESSES · SHEARS
CRANES · GENERATORS · ELEVATOR
CONVEYORS · HOISTS · CENTRIFUGES · SY
· GENERATORS · AIR CONDITIONING SY
CANNING EQUIPMENT · PRINTING PRES
CRUSHERS · TEXTILE MACHINES · DRYER
GRINDERS · PORTABLE WELDERS · BOTT
STEEL MACHINERY
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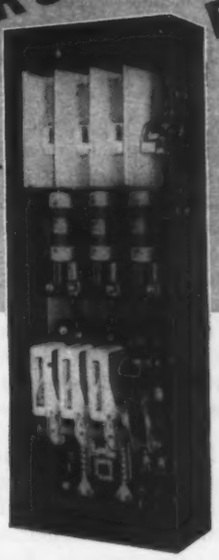


-look to Monitor for the Right Control

Accidents due to motor overloads, a jammed machine or a careless operator are mighty remote when your equipment is protected with Monitor Automatic Control.

As Electrical Engineers specializing in the design and manufacture of one basic product we can draw on a wealth of experience to assist you in selecting exactly the right type of control for your product—whether it requires a simple push-button station or a battery of high-tension contactors. So before you begin experimenting at your own expense, call in a Monitor Field Engineer and let him assume the responsibility for an economical and efficient control. . . . We are ably represented in all important cities.

Monitor — The Original "Just Press a Button" System — Baltimore, Md.

Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

Mr. Evans' Stockton position, GEORGE A. PEERS has been transferred from the Coast Valleys division, where he was likewise division superintendent. New division superintendent there is WILLIAM T. HANNUM, who has been moved from the general office in San Francisco, where he was assistant engineer in line construction.

▶ ROBERT A. GRAVES, who has been connected with the power sales department of the Kansas City Power & Light Co., has been appointed to the position of purchasing agent, the position which has remained unfilled since the recent death of T. R. Harber. Mr. Graves has been connected with the Kansas City utility since 1920.

▶ HENRY B. KANE, for the past twelve years connected with the Boston Edison Co. in illuminating engineering, electric kitchen promotion and power sales activities, has resigned to join the staff of the Massachusetts Institute of Technology to engage in special administrative work.

▶ CARL F. OBERMAIER, who has been manager of the General Electric Co.'s York wire works at York, Pa., for the past 29 years, has retired on pension at the age of 65, in accordance with the company's retirement policy. F. R. KAIMER, who has been Mr. Obermaier's assistant for the past ten years, has been named general superintendent of the factory and has assumed his predecessor's place on the management committee.

▶ E. F. MURPHY, assistant sales manager of the New York district office of the Graybar Electric Co., has been appointed Eastern commercial sales manager for the company. Starting in 1919 at Chicago, Mr. Murphy has acted as power and light specialist, appliance specialist, syndicate sales manager, assistant sales manager at New York district office and now, after 21 years of service, Eastern commercial sales manager. Mr. Murphy will make his headquarters at the New York district office.

▶ HOWARD W. TETER has been appointed manager of the Boston office of the Edison Storage Battery Supply Co., succeeding P. F. Donovan, who has resigned on account of ill health. Mr. Teter was educated at William Penn College in Iowa, and in his early business career was connected with the Western Electric Co. at Minneapolis and the Great Northern Railway in St. Paul. He entered the employ of the Edison company in 1929 as service engineer in St. Paul, later being in New York and Birmingham, Ala. Recently he was sales and service engineer of the Edison Storage Battery Division of Thomas A. Edison, Inc., at St. Louis, Mo.

A. P. Craig Named Director of Westinghouse Exhibit

Albert P. Craig, Jr., has been appointed director of the Westinghouse exhibit at the New York World's Fair. Mr. Craig was assistant director of the company's World Fair activities in 1939. He succeeds E. H. Sniffin, retired, both as exhibit director and as a member of the executive committee of the Air Exhibitors' Association.

Mr. Craig has worked in the shops

Blank & Stoller

at East Pittsburgh and on the sales staff of the company's industrial division in New York, where he specialized in working with architects and engineering consultants, helping them plan the electrical needs of their clients.

•

▶ LEE COX, formerly divisional manager on the Pacific Coast for the Borg-Warner Corp., has been appointed Pacific Coast and Intermountain sales manager for all Norge products, with headquarters in San Francisco.

▶ F. D. CROWTHER and H. E. MAHAN have been named managers respectively of the lighting sales section and the illuminating laboratory section of the lighting division of the General Electric Co. Mr. Crowther joined General Electric on the test course at Schenectady. In 1928 he entered the illuminating engineering laboratory, became a lighting engineer and continued in that capacity until 1930. After a leave of absence he returned to General Electric illuminating laboratory in 1932, entered the commercial section, specializing in street lighting, and since January, 1939, he was commercial assistant to the lighting sales manager. Mr. Mahan entered G.E. test in 1910, becoming a member of the illuminating laboratory in the same year. In 1915 he assisted in the lighting of the Panama-Pacific Exposition and since that time has been closely associated with the exposition illumination at the Century of Progress in Chicago and the Golden Gate International Exposition in San Francisco. He became assistant manager in charge of engineering at the illuminating laboratory in 1932.

OBITUARY

▶ CHARLES MUNSON, 66, division manager of the Iowa Electric Light & Power Co., at Marshalltown, died in that city on March 30 following a long illness.

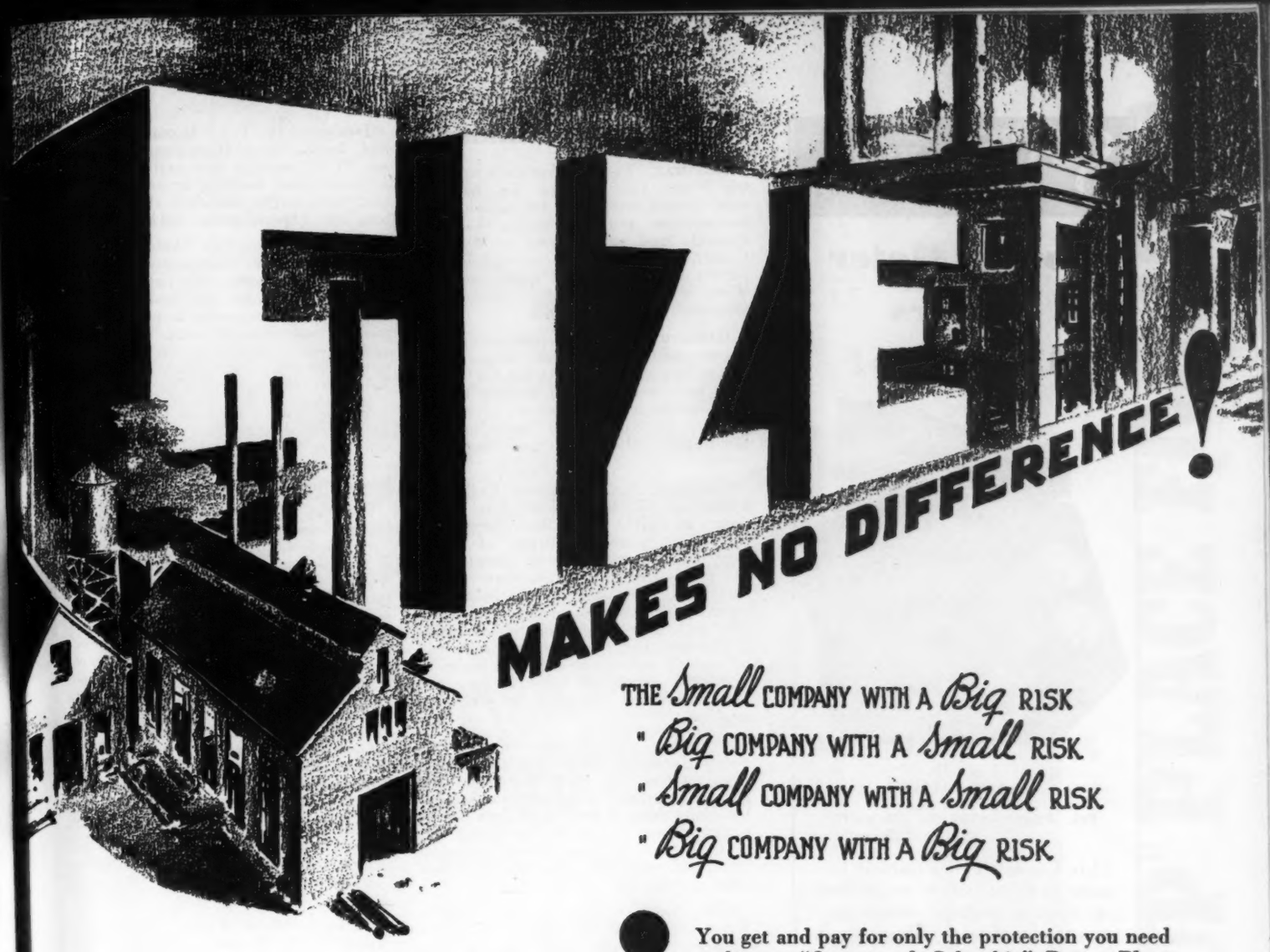
▶ ARTHUR THURSTON, 67, assistant electrical engineer of the Public Service Co. of New Hampshire, died at Manchester, N. H., on April 4. He was a native of Lowell, Mass., and was graduated from Tufts Engineering School in 1896. He entered the employ of the former Manchester Traction, Light & Power Co. in 1902.

▶ COL. E. W. M. BAILEY, 76, a pioneer manufacturer of electric passenger vehicles at Amesbury, Mass., and prominent in the activities of the former Electric Motor Car Club of Boston, died at Barbados, B.W.I., on March 8, where he was spending the winter.

▶ ELMER P. VAUGHN, 50, superintendent of the Randolph & Holbrook division of the Weymouth (Mass.) Light & Power Co., died at his home in Randolph on February 16, after many months of ill health. He was a native of Marlboro, Mass., and had been located at Randolph for about 30 years.

▶ HENRY A. KNIGHT, 86, superintendent of street lighting at Worcester, Mass., from 1891 and supervisor of wires from 1895 until his retirement in 1936, died in that city on April 11. He was a native of Worcester and was a past-president of the Massachusetts Association of Electrical Inspectors, highly influential in the extension of underground construction at Worcester and widely known in Eastern electrical circles for his probity and grasp of safety engineering in relation to wiring and accessories.

▶ WALTER F. KEENAN, JR., director and vice-president in charge of engineering of Foster Wheeler Corp., New York, died at his home in Pelham Manor, New York, on March 18. He was 54 years old. As president of the American Boiler Manufacturers Association for the past two years, as an active designer of prominent steam generators and for pioneering in the development of fundamental improvements, he was widely known throughout public utility and industrial power plant circles in North America and Europe.



SIZE MAKES NO DIFFERENCE!

THE *Small* COMPANY WITH A *Big* RISK
" *Big* COMPANY WITH A *Small* RISK
" *Small* COMPANY WITH A *Small* RISK
" *Big* COMPANY WITH A *Big* RISK

You get and pay for only the protection you need under an "Ocean and Columbia" Power Plant Policy. No more, no less! Large company or small, big risk or little . . the only economically sound basis for buying boiler and machinery insurance is to have exactly the right amount of it. TOO MUCH doesn't give you more than you need . . . but it costs you more. TOO LITTLE can be disastrous and cost you EVEN MORE!

"Ocean and Columbia" have a specially trained staff whose job is to eliminate guesswork in shaping your protection. Accurate analysis and long experience combine to suggest a program based on fact and need. Luxury trimmings are not considered because to "Ocean and Columbia" this is a partnership job.

When the effects of operating failure have been measured . . when you are protected by the intelligent application of insurance principles . . then "Ocean and Columbia" engineers start the job of preventing accidents. . . A check-book may protect your investment but it can never compensate for the destruction of human lives, the loss of carefully built good-will and the heartaches of rebuilding a cherished business. The serious view which "Ocean and Columbia" engineers take of their responsibility to American Industry is proved by an impressive national record of accident frequency reduction.

Expert, common sense analysis of the boiler and machinery exposures in *your* plant . . . regardless of its size . . . is yours without obligation.

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COLUMBIA CASUALTY COMPANY

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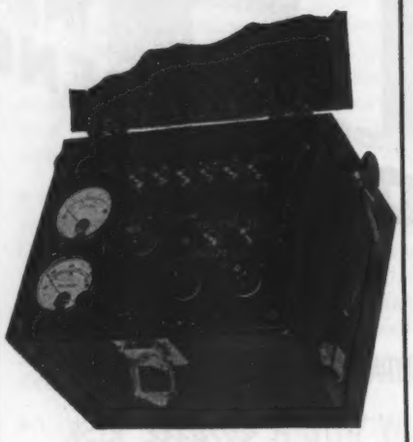
STATES TESTING EQUIPMENT

Power Meter Testers

Attention!



Type ID
Cat. No. 11548

Pri. Range:—100 to 125 volts
200 to 250 volts

This Load permits tests at the *same current values* regardless of system voltage changes—due to the Primary Regulating Switch.

The features embodied in this Load include:

1. An adjustable reactance and resistance for variable burdens
2. Build-in current and voltage indicators
3. 20 volt secondary
4. 50% Power Factor Switch for 2½ – 5 amperes
5. 100% control switches for ⅛, ¼, ½, 2½, 5 amperes
6. Primary Regulating Switch in 5 volt steps for 100 to 125 volts, 200 to 250 volts
7. Suitable for demand meter testing.

—A Load with a satisfactory phase angle for testing at 50% power factor.

For further information

····TEAR OFF AND MAIL TODAY····

To THE STATES COMPANY
Hartford, Conn.

Name .....
Title .....
Company .....
City .....*State*.....

Sales Opportunities

PINEVILLE, W. VA.—Appalachian Electric Power Co., Roanoke, Va., has surveys nearing completion for extensions in transmission and distributing lines at Pineville and other points in Wyoming County, including power substation units, service connections and other facilities. Work is scheduled to begin soon. Cost estimated close to $200,000.

MARSHFIELD, WIS.—Electric and Water Department is having plans prepared for new municipal power station, 40 x 100 feet, with installation to include turbine unit, switchboard and auxiliary equipment. Helmick, Edeskuty & Lutz, Essex Building, Minneapolis, Minn., are consulting engineers.

FAIRFIELD, ALA.—Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., a subsidiary of United States Steel Corporation, New York, plans installation of heavy-duty motors and controls, transformers and accessories, switchgear, power panels, duct lines, conveyors, electric hoists and other equipment in connection with expansion and improvement in tinplate mills at Fairfield. Large increased capacity will be carried out. Cost estimated close to $5,000,000. Work will begin at once and will be carried out over a period of months.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, Knoxville, receives bids until May 3 for two hydraulic turbines with governor systems for Units Nos. 9 and 10, Wilson hydroelectric power station, Wilson dam. Also, at same time, for two electric generator units and accessories for hydraulic turbines noted.

LOS ANGELES, CALIF.—Los Angeles Water and Power Department, 207 South Broadway, will take bids soon for one-story load dispatchers' headquarters station at 117 South Boylston Avenue. Cost estimated close to $100,000, with equipment. Plans also are nearing completion, with bids scheduled to be called at early date for new one-story office and operating building at Broadway and Manchester Avenue, to cost approximately $50,000. Contract has been awarded to Westcott, Stoker & Brown, 1831 North Main Street, at $221,000, for erection of a three-story electrical repair and equipment maintenance shop, 120 x 180 feet, at 1530 St. John Street. Contract price is exclusive of equipment installation.

PORTLAND, ORE.—Portland General Electric Co. has plans maturing for extensions and improvements in local Clackamas power substation, with installation of additional equipment. Cost estimated close to $50,000. A new power substation and bus structure will be built at Salem, Ore., with initial capacity of 12,500-kva., to cost approximately $90,000, and new power substation at Newberg, Ore., estimated to cost about $50,000. This is part of 1940 expansion and improvement program of company.

ABBEVILLE, S. C.—City Council receives bids until April 26 for 44-kv. transmission line from connection with municipal hydroelectric power station on Rocky River to Buzzard's Roost hydroelectric power development of Greenwood County Finance Board, Greenwood, S. C., about 17 miles, with tie-in power substation unit for exchange of power between the two plants. Estimated cost about $52,000. Wiedeman & Singleton, Candler Building, Atlanta, Ga., are consulting engineers.

JACKSONVILLE, FLA.—Bureau of Yards and Docks, Navy Department, Washington, D. C., receives bids until May 8 for a power plant building at naval air station, Jacksonville, including electrical system, etc. (Specifications 9414).

TOLEDO, OHIO—City Auto Stamping Co., Lint Avenue, manufacturer of metal stampings for automobile service, plans installation of motors and controls, regulators, duct lines, conveyors and other equipment in new one-story plant, about 80,000 square feet of floor space, for die production. Erection is scheduled to begin in June. Cost estimated close to $500,000.

MADISON, WIS.—Madison Gas & Electric Co. is completing plans for new power substation on site near city, including extensions in transmission and distributing lines. Proposed to begin work soon.

CHICAGO, ILL. — Commonwealth Edison Co. has filed plans for one-story addition, 52 x 55 feet, to 12-kv. power substation at Sixty-second Street and Cottage Grove Avenue, to cost over $50,000, with equipment. Work on superstructure will proceed at once. H. V. Van Holst, 140 South Dearborn Street, is architect.

BEREA, OHIO—City Council plans call for bids early in May for extensions and improvements in municipal power plant, including new 1500 to 2000-kw. generator unit and accessories, boiler and auxiliary equipment. Cost reported over $225,000. William C. Kammerer & Associates, 1900 Euclid Avenue, Cleveland, Ohio, are consulting engineers.

ALAMEDA, CALIF.—Bureau of Supplies and Accounts, Navy Department, Washington, receives bids until April 30 for two motor-generator sets for station at Alameda (Schedule 1317).

DETROIT, MICH.—Chrysler Corp. 341 Massachusetts Avenue, plans installation of motors and controls, switchgear, regulators, duct lines, conveyors, electric hoists and other equipment in one and two-story addition to automobile parts plant on Oakland Avenue, Highland Park, 135 x 577 feet, to be used as a machine shop and press building. Cost reported close to $300,000. Albert Kahn, Inc., New Center Building, is architect and engineer.

ALHAMBRA, CALIF.—Southern California Edison Co., Los Angeles, is arranging calls for bids for new power substation on Alhambra Road, Alhambra. Work will be carried out during next 60 to 90 days.

PORTLAND, ORE.—Administrator, Bonneville Project, Department of Interior, 811 N. E. Oregon Street, Portland, receives bids until May 3 for construction of St. Johns power substation, near Portland, including control house and auxiliary structures (Circular 947). Also, at same time, for three 1000-kva. transformers (Circular 940).

MEDFORD, ORE. — California-Oregon Power Co., Medford, has plans maturing for proposed new transmission line from Medford to Grants Pass, about 40 miles, estimated to cost close to $140,000. This is part of 1940 line expansion and improvement program.

STERLING, KAN.—City Council has plans under way for extensions and improvements in municipal power plant, including installation of additional equipment. Cost estimated about $80,000. A bond issue in that amount has been authorized. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

YOUR "LOOKING UP" PLACE FOR 1940

"THE LAMB IS KILLING THE BUTCHER!"

Something serious is happening! Our own salesmen *are being sold the product they're supposed to be selling.*

It used to be different. A few years ago our men came to your offices to tell you the interesting facts about LUX carbon dioxide fire extinguishers. You listened to the story of built-in Lux System protection for large machinery. You learned how LUX kills electrical fires quickly, safely . . . how LUX reduces damage.

NOW YOU'RE TELLING US

But now *we're* listening to you! And learning a great deal.

Our representatives are hearing of the things you are doing with LUX carbon dioxide protection . . . of ingenious ways of guarding underground transformer vaults from fire. Your engineers are making valuable suggestions in design of LUX Built-In Systems. You are constantly telling us of new applications which you have evolved.

Please keep it up. We are honored that you think well of LUX extinguishing equipment . . . so well that you often tell us new and exciting things about our own product. We hope you'll continue to do so for a long time to come.

Walter Kidde & Company, Inc.
428 West Street • Bloomfield, New Jersey

LUX
SNUFFS OUT FIRE

Recent Rate Changes

OTTER TAIL POWER CO. and the city of Fergus Falls, Minn., have reached an agreement which will result in a saving of approximately $3,000 a year to the city in electric power charges. Rates previously had been figured on a demand charge based on the peak load the company must be prepared and equipped to handle. This peak has been figured on the demand during the period just preceding Christmas, when many extra lights are used. The new agreement eliminated street Christmas lighting from the peak and brings about other computations which will result in substantial savings to the city.

WISCONSIN POWER & LIGHT CO.'s application to reduce rates to commercial power and light customers $70,000 annually has been approved by the state Public Service Commission. The new rates became effective with March meter readings. The rates will affect 8,900 commercial light customers, 1,600 small power customers and 42 combined light and power customers of the utility throughout the state.

COLUMBUS & SOUTHERN OHIO ELECTRIC CO., Columbus, Ohio, has been authorized by the state Public Utilities Commission to file revised schedules for residential customers in Franklin County (Columbus) as follows: From first 30 kw.-hr. per month, 5 cents per kilowatt-hour; next 60 kw.-hr., 4½ cents per kilowatt-hour; next 60 kw.-hr., 4 cents per kilowatt-hour; excess, 3 cents, monthly minimum charge of 50 cents; To first 40 kw.-hr. per month, 4½ cents per kilowatt-hour; next 60 kw.-hr., 4 cents per kilowatt-hour; next 60 kw.-hr., 3 cents per kilowatt-hour; excess, 2½ cents per kilowatt-hour; monthly minimum charge of 50 cents.

WESTERN RESERVE POWER & LIGHT CO. has been authorized by the Ohio Public Utilities Commission to revise its general power schedule applying throughout its territory so as to reduce the rates for users of 20 hp. and more; establish an optional regulation for capacities of 150 hp. or more whereunder the annual minimum charge will be $9 per horsepower, and establish a regulation whereunder kilowatt-hours metered at primary voltage shall be billed at 5 per cent less than actual, effective May 1.

ILLINOIS COMMERCE COMMISSION has announced that rate changes effective during the month of March resulted in an estimated reduction of $30,816 in annual operating revenues. Electric rate reductions account for $6,201 of this total.

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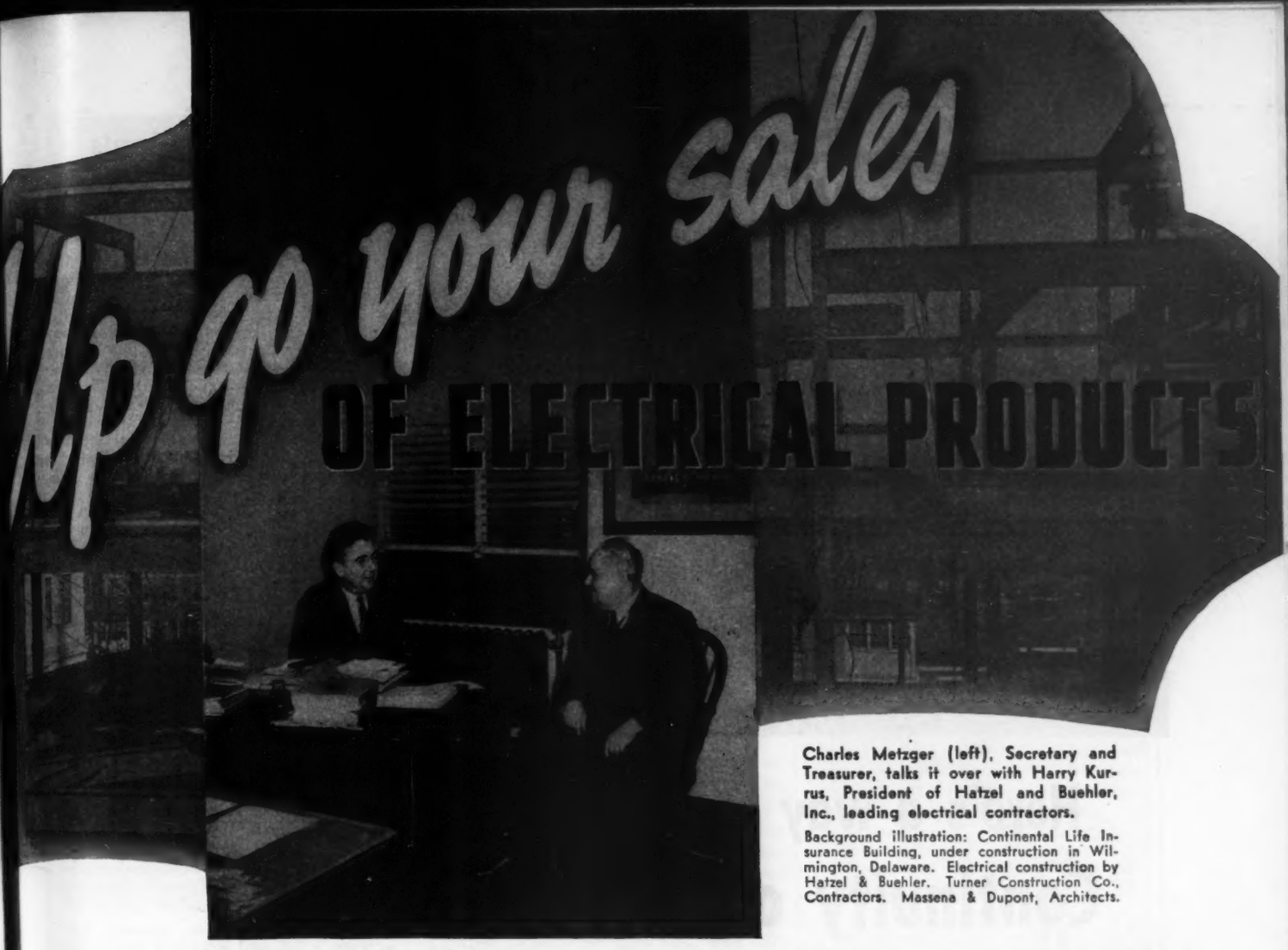
Power Laundry Industry

The Marketing Research Division of the Department of Commerce has published a detailed study of the commercial power laundry industry of the United States. The industry gives employment to an average of 238,000 persons and during the past few years has had an operating average income of over $400,000,000 annually. The study offers industrial marketing executives a basic picture of the location and density of the part of their market represented by the commercial power laundry industry.



Charles Metzger (left), Secretary and Treasurer, talks it over with Harry Kurrus, President of Hatzel and Buehler, Inc., leading electrical contractors.

Background illustration: Continental Life Insurance Building, under construction in Wilmington, Delaware. Electrical construction by Hatzel & Buehler. Turner Construction Co., Contractors. Massena & Dupont, Architects.

When you advertise consistently to men like these

Strip the story of all excess verbiage and it boils down to just this:

YOUR OBJECTIVE. . . To get more orders, at a greater net profit.

OUR CLAIM. . . That consistent advertising in Electrical Contracting will help you achieve this objective.

WHY?. . . Because, when you tell a sales story on your products that is sufficiently complete to inspire action—and this message is seen, month after month, by over 16,000 electrical contractors, industrial chief electricians, and other electrical buyers—*the inevitable result is greater recognition and less sales resistance for these products.* (Many hard-hitting ads produce actual orders, too.)

PROOF. . . If you advertise to get direct returns, we can show you copy that has pulled hundreds of them. If you're interested in the broad selling job that advertising can do, we'd like an opportunity to show you campaigns that have helped boost recognition and sales for electrical manufacturers, large and small.

We *know* that good advertising in Electrical Contracting pays. But it's *your* money, and we don't blame you for going ahead cautiously. That's why we urge you to make a *test* campaign, tied to a specific objective. It doesn't cost much. We'll be glad to suggest a theme that can help ring the cash register—or show you samples of successful copy appeals—if you'll just say the word.

ast month, we told you bout a fitting manufacturer hose ad brought 50 returns the first week Electrical Con-racting was issued. Total re-turns to date, over 200—and still pulling!

electrical contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION AND MAINTENANCE

Serving Electrical Contractors, Electrical Men in Large Plants, and Other Electrical Buyers

Here's a way to improve Continuity of Service

...at moderate cost!

Your company has invested thousands upon thousands of dollars in plant equipment to assure continuity of service. Yet storms and other emergencies are bound to cause interruptions occasionally.

What wouldn't you give to *prevent these breaks*—if that were possible?

How much is it worth to you to *restore service faster?* That's something you *can* do—with the aid of Western Electric Radio Telephone.

Radio telephone service between headquarters and trucks enables you to get crews on the job faster—give them instructions instantly at the scene of trouble—restore service perhaps hours sooner. Western Electric equipment is thoroughly dependable—made by Bell Telephone makers to fit your service needs.

At a moderate cost, radio will protect your plant investment and insure your customers' good will.

For full details, write to the distributors listed below.

Distributed by Graybar Electric Company

DISTRIBUTORS: *In U. S. A.:* Graybar Electric Co., New York. *In Canada and Newfoundland:* Northern Electric Co., Ltd. *In other countries:* International Standard Electric Corp.

Western Electric
RADIO TELEPHONE EQUIPMENT

Municipal Plants

NORTH BALTIMORE, OHIO—The long legal battle between this village and the Central Ohio Light & Power Co. reached a new temporary stalemate recently following rulings on injunction pleas by Judge E. K. Solether of the Woods County Court of Common Pleas. On the advice of the State Supreme Court, Judge Solether granted the village permission to negotiate for the sale of bonds to finance the erection of a municipal power plant. The company had contended the election at which voters approved the bond issue 18 months ago was irregular. The village, however, probably will defer further action on the bond issue until it is determined whether the bonds, as voted, are to be of the mortgage revenue or general taxation type. Judge Solether decided against the village on its plea to restrain the company from erecting a 33,000-volt line to service the France Stone Co. quarry and on the company's pleas that village officials be restrained from intefering with company workmen engaged in the erection of the line. However, the village filed a supersedent bond for an appeal to higher courts of its injunction plea and work on the line must be delayed until a ruling on the appeal, Judge Solether said.

OREGON, WIS.—Voters on April 2 rejected by 204 to 151 a referendum proposal to purchase the privately owned electric plant of the Oregon Electric Co. for $65,000, despite the fact that the village board had previously favored acquisition of the property.

BLOOMINGTON, WIS.—Municipal acquisition of the Interstate Power Co. property was voted down by the village, 141 to 138.

SUPERIOR, WIS.—Voters rejected 6,498 to 4,690 a proposal providing for immediate negotiations with the Superior Water, Light & Power Co. for purchase of its utility plants for $3,950,000. As a result of this referendum the City Council has voted to discontinue all present acquisition proceedings and so notified the state Public Service Commission so that all hearings might be dropped.

PAMPA, TEX.—Voting on a clean-cut issue of municipal ownership of the light and power plant at the regular biennial election held on April 2, the voters of this city swept out of office by virtually a three to one majority the Mayor and City Commissioners who had sponsored the municipal ownership move, replacing them with a complete ticket opposed to municipal ownership. The election was unusually spirited and the vote cast was the largest in the history of the city. Pampa is supplied with lighting and power service by the Southwestern Public Service Co.

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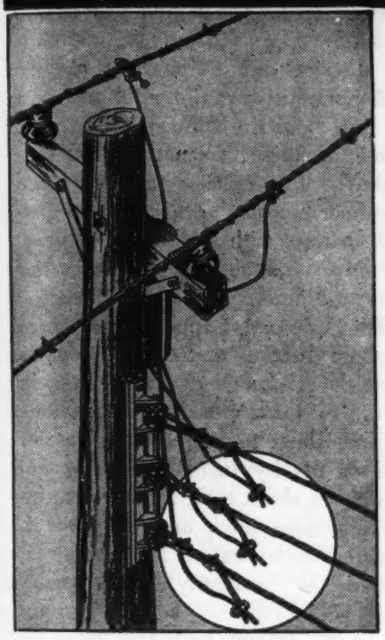
Export License Revoked

Federal Power Commission has terminated the authorization to export electric energy from the United States to Mexico which was issued to the Tigre Mining Co., S.A. in 1937. No electric energy has been exported since July, 1938. The Tigre Co. stated that it has ceased its operations at that time, due to economic conditions in Mexico, and would not resume its business until conditions change for the better.

modernize
YOUR
DISTRIBUTION
PRACTICE—



Rural line transformer pole with a secondary span to a yard pole.

RELIABLE SOLDERLESS CONNECTORS

Split bolt connectors have become standard in the industry. Reliable Electric offers well designed types for all applications. Shown above are aluminum to copper connectors which provide adequate spacing between the red and white wires to avoid galvanic corrosion.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

Sweden Goes to High Voltage on New Line

The past decade's trend of electric power supply expansion in Sweden has been one of a systematic and purposeful evolution within the ramifications of rigid economic principles. Because large amount of hydro power must be transmitted over long distances a new scheme is now being contemplated by the Royal Waterfalls Board.

A voltage of 220 kv. is the highest in use in Sweden at present. This is held to be insufficient for transmission on a large scale from the Lule River to a suitable point in Middle Sweden. It is contemplated to use 380 kv., which would make it possible to transmit 300 megawatts on a single line. The use of such a high voltage will entail a number of fresh problems. The radiation would cause much greater disturbance to telephone lines and broadcasting than the present 220-kv. lines and the cross-section of conductors would have to be greatly increased in order to avoid such trouble.

Instead of using the present conductors of 28-mm. outside diameter, new conductors with a diameter of 50 mm. would be required, and the number of insulator units in the suspension links would have to be increased from 15 to at least 25, it is held. The costs of such a long 380-kv. line would be rather formidable, it is said, and only justified for transmission on a very large amount of power.

Since the outbreak of war in Europe new legislation has been put into effect regulating the building of transmission lines. The government now decides if projects are necessary and compatible to the general electrification scheme, and issues concessions accordingly. All owners or operators are obliged to adjust power tariffs according to consumers' justified claims.

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Moulded Products Moves

Synthetic Moulded Products, Stonington, Conn., has announced its intention to transfer its plant from that place to Wakefield, R. I. O. W. Greene is principal owner.

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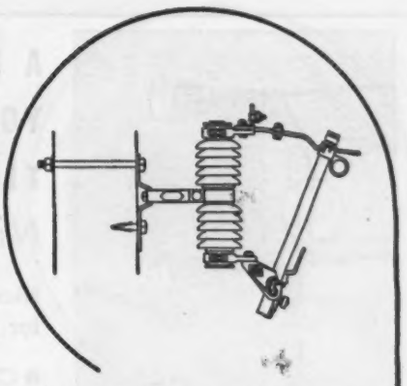
All-Electric Kitchen

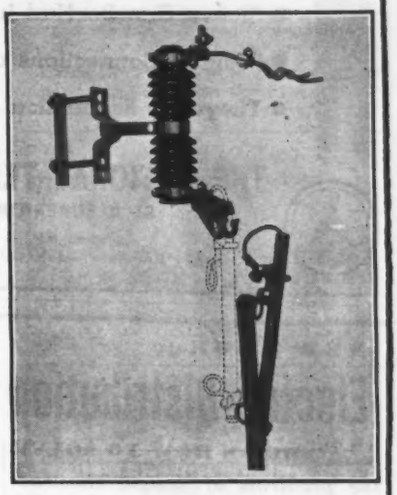
The Electrical League of Utah has started construction of an all-electric home to emphasize to the home-buying and home-building public the importance of adequate wiring, modern electric kitchens and complete electrical service.



Fuseholders can be easily and safely removed or replaced with standard ballpoint hotsticks.

Fuseholders can't be installed backwards.

Fuseholders won't weld to upper arm during heavy short circuit.



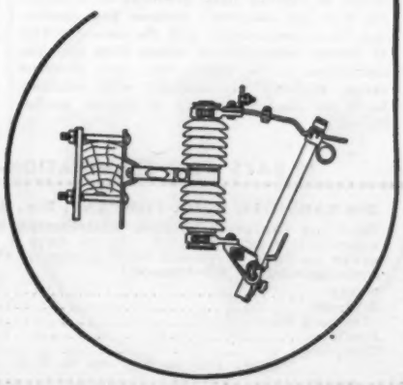
LOW TENSION OPEN TYPE
DROPOUT
MATTHEWS FUSWITCHES

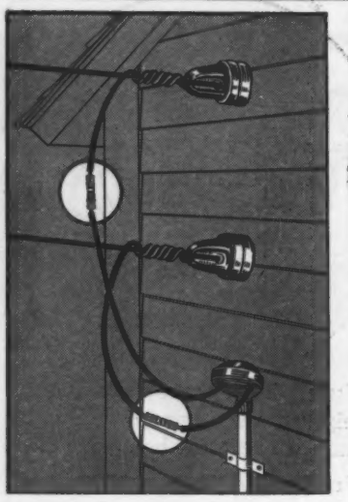
Fusing: 100 Amperes. Rupturing capacity 2000 and 4000 Amperes.

5 K. V.—7½/12½ K. V. y Grd.—15 K. V.

Try at our risk.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.





A BETTER WAY TO MAKE YOUR SERVICE CONNECTIONS — Use NATIONAL *Nicopress* SPLICING SLEEVES

Nicopress Sleeves are Unsurpassed for making service connections.

- **Connections are Easily made with the Nicopress Compression Tool.**
- **Splices are Strong and Tight.**

- **Joints are Neat in Appearance and—**
- **Very Easy to tape.**
- **Sleeve Can Be Had in Reducing Sizes.**
- **Positive Connections are formed.**
- **They are Economical.**

THE NATIONAL TELEPHONE SUPPLY COMPANY
5100 SUPERIOR AVE., CLEVELAND, OHIO
Canadian Mfr. — N. Slater Co., Ltd., Hamilton, Ont.
Export Distributor — International Standard Electric Corp., New York, N. Y.

NEW BOOK

Electric Distribution Fundamentals

Just Out

SHOWS HOW TO SOLVE

the problems of design, construction, operation, service, methods, equipment, mechanics, and materials of electric distribution

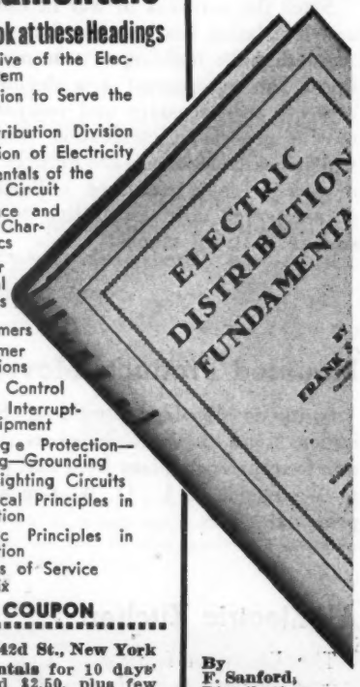
From a non-engineering viewpoint, this book outlines features of both utility distribution and the industrial and inside wiring branches of service to the outlet.

THE ABC OF ELECTRIC DISTRIBUTION

Tells how the distribution system is designed and built, how it works, and how it is serviced and operated; explains equipment and its use, design of carrying lines, problems of maintaining flow, and materials; discusses how distribution fits in economically with the general system of electric supply; covers voltage drop, wire size calculation, power factor, etc., etc. Practical design problems are included with solutions based on diagrams instead of difficult mathematics.

Look at these Headings

- Perspective of the Electric System
- Distribution to Serve the Load
- The Distribution Division
- Generation of Electricity
- Fundamentals of the Electric Circuit
- Inductance and Related Characteristics
- Tools for Electrical Problems
- Transformers
- Transformer Connections
- Voltage Control
- Current Interrupting Equipment
- Voltage Protection—Lightning—Grounding
- Street Lighting Circuits
- Mechanical Principles in Distribution
- Economic Principles in Distribution
- Measures of Service
- Appendix



By F. Sanford, Distribution Engineer, Cincinnati Gas & Electric Co.

242 pages
156 illustrations
15 tables
1 chart
$2.50

10 DAYS' FREE EXAMINATION—MAIL COUPON

McGRAW-HILL BOOK COMPANY, Inc., 330 West 42d St., New York
Send me Sanford's **Electric Distribution Fundamentals** for 10 days' examination on approval. In 10 days I will send $2.50, plus few cents postage, or return book postpaid. **(We pay postage on orders accompanied by remittance.)**

Name .....
Address .....
City and State .....
Position .....
Company W.4-20-40

(Books sent on approval in U. S. and Canada only.)

Ranges and Water Heaters Respond to Promotion

[*Continued from page 59*]

Company. It included the potential market by districts for appliances, campaign schedules, and set down the company's merchandising policy which encourages dealer sales activities.

Once a year the company conducts a major appliance survey, counting by districts the number of electric and competitive major appliances on its lines and the saturation of each. Some of this information, together with the information received from customer record sheets, is used to furnish dealers with select lists of prospects for cooking, water heating and refrigeration.

The Company appoints salesmen in some districts and employs dealer sales development representatives in others to work closely with dealers, helping them to increase their sales and profits by furnishing leads, information about their business, training and personnel, and, in general, working with dealers to the mutual benefit of company and dealer. Proofs of company advertising are shown to dealers with the insertion dates in order to secure dealer tie-in ads.

Dealer Displays

During specified periods dealers are invited to display their merchandise on company sales floors. And all company advertising bears the invitation to "See your Electric Dealer."

Newspaper, radio, window display, billboards, bill inserts and direct mail are the principal advertising media used. All advertising stresses the fact that "electricity is cheap." The average cost figure of $2.50 for cooking or heating water electrically (if electric refrigeration is already being used) is emphasized in major use ads.

All advertising ties in with company campaigns and, in some instances, the company campaign theme is used as the advertising theme. In many cases the advertising ties in with national promotions such as those sponsored by the Modern Kitchen Bureau.

Window displays are uniform throughout the territory and are changed weekly in the 30 district offices.

One form of advertising the company found to be very effective was a series of four direct mail letters signed by the manager of each district and sent to selected cooking prospects. The many advantages of cooking electrically were emphasized in these letters along with the average cost of about $2.50 a month or "only 8 cents a day."

On the radio news broadcasts were sponsored, with short announcements about the value and cheapness of Florida Power & Light Company electric service and an invitation to "See us or your electric dealer."

Four Campaigns

The company sponsored four major sales campaigns in 1939—each lasting about three months—all of which included the promotion of electric cooking and water heating. The "Special Delivery Opportunity," a revenue recovery campaign following a rate reduction in December, 1938, was followed by the "Battle Cry of Freedom." During July, August and September the "Bargain Bringers" campaign was launched, based on rate case refunds, followed by the latest activity, "The Accent on Youth."

Letters are written to all electric distributors before a campaign is launched, explaining it in detail, so that they may make advance preparations to tie in through their outlets. Dealer meetings are held and special dealer prospectuses distributed outlining reasons why they should cash in, appliances featured, quotas, sales helps and cash prizes set up by the company on a competitive basis.

Prospectuses are distributed to company salesmen in special campaign meetings. The campaign set up is explained and the prizes are played up. Company salesmen receive prizes in terms of "merits" which are used in ordering merchandise prizes from a national organization. Each salesman is furnished a prize book which illustrates in color and describes the various prizes offered.

In the Revenue Recovery Campaign almost every conceivable form of advertising was used, from lapel buttons to truck streamers, and newspaper and radio advertising was increased. Company and dealer salesmen were given small books showing the constant decrease in the cost of electric service and the number of recent rate reductions. Each book contained a comparison of old and new rates by kilowatt-hours and listed the "free" kilowatt-hours provided by the reduction. The back of the book listed the approximate monthly kilowatt-hour consumption of various uses of service so the customer could see what appliances she could use at no increase in her present bill.

A booklet was prepared for personal distribution to each customer, graphically illustrating the story behind cheap, dependable Florida Power & Light Company service. A "Guessing Game" card was attached and, if mailed to the company, a free night light was awarded. One question was the type of appliance the customer wanted next. These prospects were turned over to company and dealer salesmen.

•

Board Permits Utilities to Build Rural Lines

Illinois Commerce Commission has granted the Illinois-Iowa Power Co. and the Illinois Northern Utilities Co. certificates to construct 105.9 miles of rural electric line in eight counties. The Illinois-Iowa utility obtained certificates for 93.95 miles of lines to be built in Bureau, La Salle, Stark, Boone, De Kalb, Whiteside, Carroll and Ogle counties.

A certificate also was granted the Illinois-Iowa Power Co. to construct 8.61 miles of 33,000-volt transmission line in St. Clair County to serve as an additional supply source at Scott Field, Army air base near Belleville.

•

Tampa Electric Opposes 36 per Cent Rate Cut

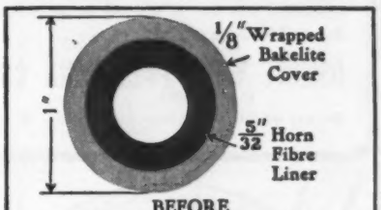
Replying to an order of the Tampa, Fla., Utility Board tentatively cutting electric rates in Tampa an average of 36 per cent, the Tampa Electric Co. produced engineering figures to show that present rates are fair.

The company said present rates are yielding less than 6 per cent on its real and legitimate investment, while the Utility Board law guarantees a minimum return of 7 per cent. The company also said it was operating the street railway at a loss and that any reduction in electric rates would force an increase in street car fares.

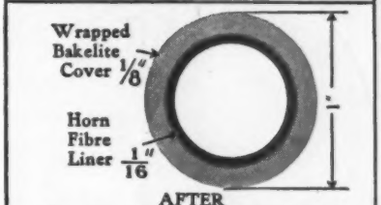
EXCELLENT SERVICE SINCE 1930

Photograph above shows Heavy Duty Open Type Dropout Matthews Fuswitch clearing 4600 amperes at 5400 volts, 25 cycles on test. Note that the vented Fuseholder is clearing the arc at both ends. This particular Fuseholder was tested to destruction and cleared 12 consecutive short circuits ranging from 1400 to 4600 peak amperes before the fibre was all gone on the inside. There was only 1/16 inch of fibre left at the bottom of the tube when it failed on the 13th shot. See drawings below. Best grade, seasoned horn fibre liners used in Matthews Fuswitches assure many more successful arc clearances.

Where short circuits will not exceed 2000 amperes the Light Duty Open Type Dropout Matthews Fuswitches are recommended.



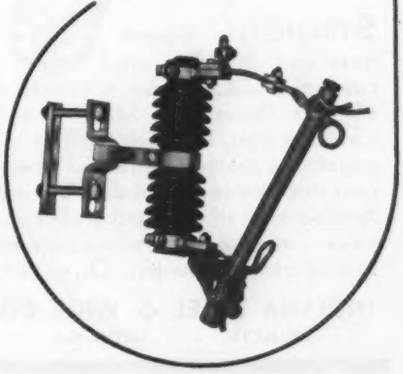
BEFORE
Cross-Section Original Tube



AFTER
Cross-Section after 13 Short Circuits

The only difference between the Light Duty and the Heavy Duty Fuswitches is in the Fuseholders. They are interchangeable in the mountings. The Heavy Duty cost a little more. Try them at our risk.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.



Schedule
OSMOPLASTIC
GROUNDLINE TREATMENT
—and slash your pole replacement costs!

Get an early start on maintenance work *now* by selecting old lines for inspection and treatment just as soon as weather permits! Schedule Osmoplastic Groundline Treatment, coordinated with inspection work, and you'll slash your pole replacement costs. Extensive service records prove that Osmoplastic extends pole's service life 7 to 10 years at a cost of only $1 to $2 per pole (including labor). Write for Osmose literature and list of leading utilities who use and endorse it.

Jersey Central Power & Light Co. has been applying Osmoplastic Groundline Treatment since 1936.

OSMOSE WOOD PRESERVING CO.
OF AMERICA, Inc.
General Offices, 1437 Bailey Ave., Buffalo, N. Y.

STRENGTH, ruggedness and durability are combined with definite economy in *Crapo* Galvanized Steel Strand. Low first cost, low maintenance expense are matters of record wherever this time-tested product is in use. Available in all standard grades and sizes from representative jobbers throughout the country. Or, write—

INDIANA STEEL & WIRE CO.
MUNCIE, : : INDIANA

Tailor-Made Plans Sell Municipal Lighting

[*Continued from page 57*]

of tourists have returned to become citizens, and we believe that our well-lighted communities have proved an attraction for them. People gravitate to well-lighted areas, whether they are window shoppers or home seekers.

Value number two attributed to good street lighting is the curtailment of crime. Although towns in southern Idaho are comparatively small and crime is not a major problem, good street lighting is unquestionably a deterrent to petty pilfering and a distinct aid to law-enforcement groups.

Value number three has to do with the direct relationship between adequate street illumination and traffic safety. The Idaho commissioner of law enforcement has issued a report to the effect that 60 per cent of the total number of traffic accidents in the state occur after dark. Last year there were 337 night accidents on unlighted streets in Idaho, compared to only 62 accidents on lighted streets during the same period. Such facts provided a powerful sales point and a forceful conclusion for our presentation.

Idaho Power Company's new street-lighting rate schedules provide for company maintenance of underground cables, for post painting, lamp renewals, cleaning and replacing broken glassware. These provisions make possible more uniform maintenance and keep service facilities in better repair with resulting higher efficiencies in illumination.

Additional Revenue

In the sales presentations to city officials the street-lighting rate was thoroughly discussed, together with an explanation of the investment required to render service. As a result of this approach we experienced almost unanimous acceptance of our proposals, and not only recovered the amount of a 10 per cent reduction, but gained additional revenue of approximately 8 per cent. This small increase in cost provided 32 per cent more illumination in our cities and towns!

The program has proved very beneficial to our company. It not only provided a worth-while increase in revenue but it was also instrumental in bringing about a better understanding on the part of municipal governing bodies as to some of the company's problems in supplying street lighting service, *i.e.*, the special investment required for such service, the relationship of load factor to all-night rates and the fact that adequate lighting is the most economical lighting since it can be furnished on an incremental cost basis.

Thus there should be less inclination, in the future, on the part of these municipalities to consider any reduction in street lighting, as they are better apprised of its real value, its economy and the part it plays in community life. Results considered, such a program has our hearty recommendation both as a vehicle for real salesmanship and as a service conducive to better public relations.

Petersen Coil Protection Equals Lightning-Proofing

[*Continued from page 57*]

use of lightning-proofing methods. This is due, of course, to the ability of the coils to eliminate faults other than those caused by lightning. It is important to note, however, that with combined Petersen coil and overhead ground wire-counterpoise protection a total of 278, or 84.8 per cent of all faults, would have been prevented, remembering the assumptions that 100 per cent effectiveness would have been obtained from the latter.

From the foregoing analysis it is apparent that the first step in providing protection to existing transmission systems might logically be the installation of Petersen coils, inasmuch as in this case they provided approximately the same over-all relief to the system as would have been obtained from lightning proofing, and for a considerably lower expenditure. Later, if conditions warrant it, overhead ground wires and counterpoise or protector tubes can be installed to obtain maximum protection.

•

Joins Radio Network

Listeners' Club, syndicated program series produced by NBC Radio-Recording Division, now is running for a series of 26 programs on WWL, New Orleans, for Louisiana Power & Light Co. The series runs through August and is broadcast on Saturday nights, from 6:15 to 6:30 p.m., local time.

LETTERS TO THE EDITOR

Likes the Idea of a "Ford" Line

To the Editor of ELECTRICAL WORLD:

Your March 9 edition of the ELECTRICAL WORLD should be of interest and help to all whose job it is to increase revenue and load building by the sale of household electric appliances and lighting fixtures.

Especially helpful was the article "Lower Cost Electric Cookery," and I would appreciate more information where I could obtain the table range and roaster as illustrated, with prices, etc.

The writer of this article also has something when he suggests a so-called "Ford" line of electric ranges, patterned somewhat after the mode of the "Special 6-cu.ft. refrigerator," as is now being promoted by the manufacturers of the leading standard refrigerators.

This would attract more attention to electric cookery and would stimulate the sale of all models of electric ranges, for there will always be those who want something better.

J. I. SHAW, Sales Manager
Provincetown Light & Power Co.,
Provincetown, Mass.

•

Vandalized Poles

To the Editor of ELECTRICAL WORLD:

In every community there are popular spots for the unemployed, the hitchhiker, and others, who amuse themselves by whittling. A telephone, telegraph or electric company pole is usually close to these popular spots and that pole, unless it is steel, becomes the victim of the whittler's knife. In my opinion the damage inflicted has cost these companies a considerable sum of money in replacement.

Safety of the lineman is an important factor. A deeply grooved pole is difficult to climb and poles have often been replaced on that account.

Various methods have been in use for protecting poles exposed to this vandalism, but these only seemed to attract the attention of whittlers, arousing the desire to whittle. Banding with flat steel tape, iron wire and guy wire introduces a hazard to the lineman.

A real protection for the exposed poles is needed; a protection that is economical, one that won't damage the pole or be unsightly, and that won't be a hazard to the company, employee or public. That protection is the application of a coating of abrasive colorless varnish or filler with body enough to carry sufficient sharp sand, carborundum dust or such. Whittling is not interesting enough to risk the razor edge of one's knife.

A pole would only have to be treated from a line 30 in. from the ground to a line 5 feet 6, as the inconvenience of reaching above or below these lines would turn whittling into work.

A survey of "damaged by whittlers" poles on any property would bring to light the tremendous waste that is going on aside from the unsightliness of the poles as they begin to reach the replacement stage.

G. E. CALLAHAN, Safety Engineer
Appalachian Electric Power Co.,
Bluefield, W. Va.

•

Recalls Switchboard Construction Idea

To the Editor of ELECTRICAL WORLD:

Mr. Van Antwerp's article "Plug-in Devices Promise Easier Maintenance, Lower Cost" (ELECTRICAL WORLD, February 24, 1940), recalls to my mind an idea which I have entertained for a number of years regarding switchboard construction. This idea was borrowed from the telephone industry and occurred to me when I was engaged in inductive interference tests in a number of small telephone offices.

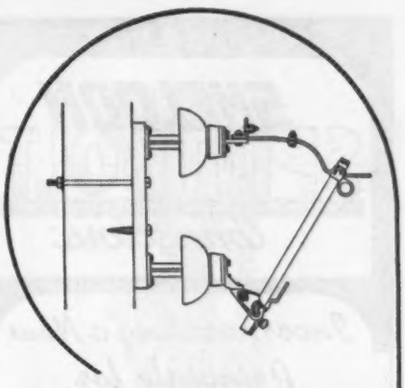
Briefly, the board would consist of a suitable frame supporting removable plates of convenient size, to be drilled to receive the instruments and meters. The basic idea is that each device be complete with its "piece" of panel, test block and local wiring to the test block.

The panel sections would be of standard dimensions and so arranged that a "piece" of panel would occupy one or more sections depending on the size of the installed device.

The secondary cable could be brought to terminal blocks where provision could be made for short circuiting current secondaries and fuses. The panel wiring from the incoming terminal block to the test block and between sections would be carried on the frame on supports arranged to permit their being changed readily. Resistors, auxiliary transformers and other devices would be mounted at the rear of the panel, as is the practice now.

The scheme is possible of many variations and with the present tendency of standardization of meter and relay cases it appears to be practicable. For some installations it would require the development of a means of indicating protective relay operations to the supervisory board other than by target indication to the relay.

Electric reset tripping relays are

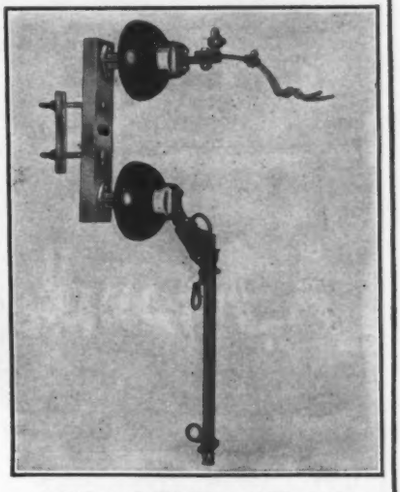


EXCELLENT SERVICE SINCE 1930

Fuseholders can be easily and safely removed or replaced with standard ballpoint hotsticks.

Fuseholders can't be installed backwards.

Fuseholders won't weld to upper arm during heavy short circuit.



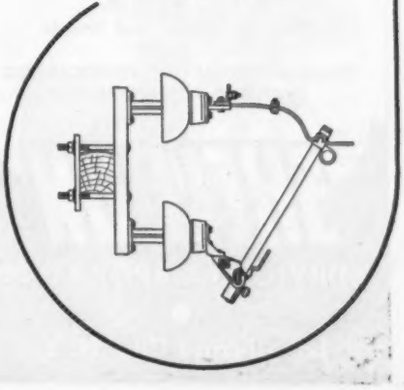
LOW TENSION OPEN TYPE DROPOUT MATTHEWS FUSWITCHES

Fusing: 100 Amperes. Rupturing capacity 2000 and 4000 Amperes.

5 K. V.—7½/12½ K. V. y Grd.—15 K. V. and 23 K. V.

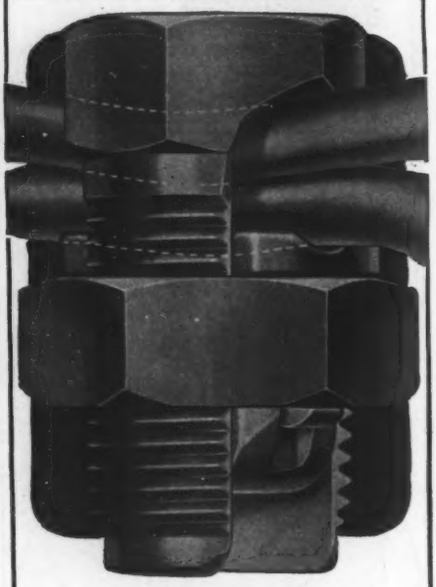
Try at our risk.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.



SHELDON
SPLITBOLT
MAXIMUM FRICTIONAL EFFICIENCY SNUB-GRIP
Connectors

Incorporating a New Principle for Permanently Holding Two Wires Together the Tightest Way



- Greatest Gripping Pressure on Wires
- Increased Contact Bearing Area
- Copper "Flowing" Reduced
- Maximum Pull-out Pressure through Vibration-proof Assembly

Write for Circular and Sample

ORIGINATORS OF THE FRICTION-FREE PRINCIPLE FOR SPLITBOLTS

SHELDON
SERVICE CORPORATION
Long Island City, N. Y.

available and most modern types of switchboard devices could be adapted to this construction. The new socket type devices would result in some simplification, since in many cases it would be unnecessary to provide test blocks.

E. E. JONES,
Mound City Electrical Engineering Co.,
Pekin, Ill.

•

Back Patting

To the Editor of ELECTRICAL WORLD:

I was very much interested in reading your editorial in ELECTRICAL WORLD for January 13 entitled "The Rank and File are Human."

I was in public utilities for a great many years, and 30 years ago was just getting my head above water and felt exactly as the employees in your editorial.

Our vice-president (vice-presidents in those days were not as common as today), who was 30 years older than myself, had a great many interests. One day I said to him: "The only time we hear from you is when things go wrong. You know it would help a lot if you would pat a man on the back once in a while when things go right."

He looked at me, thought a minute and said: "When you get older and have more responsibilities you will find that the men you would like to have pat you on the back are so busy with their own troubles that they don't have time to pat you on the back, while the people who do come around and pat you on the back are generally looking for something, and you wish they would leave you alone."

Of course he was right, but I think your editorial hits the nail on the head. There is an old Spanish proverb which, translated, reads: "In courtesies it is better to deal too many cards rather than too few," and we might very well take a few minutes to pat a man on the back for work well done.

J. B. CRANE, Export Manager
Combustion Engineering Co., Inc.,
New York, N. Y.

•

Power Use in Texas Rises

Electric power consumption in Texas continues higher than last year, the University of Texas Bureau of Business Research reports, citing a February increase of 6.3 per cent over February, 1939. Commercial use of electricity advanced 10.2 per cent, industrial 0.9 per cent, residential 7 per cent and other use 21 per cent.

POWER MAP

A time-saving service for busy individuals and organizations

Two years painstaking investigation makes available a map showing electric generating and transmitting facilities in the Western States, complete to January 1, 1940. Not since 1923 has such a service been offered. The map makes it possible to see the new electrical set-up in the Far West spread out before you —at a glance.

THE MAP SHOWS:

Type, capacity of plants
Voltage, capacity of lines
Type, size of conductors
Receiving station capacities
Interconnection capacities

52x66 in. — 1 in. = 22 mi.
Prepared by Frank I. Towle Jr.

THE MAP COVERS:

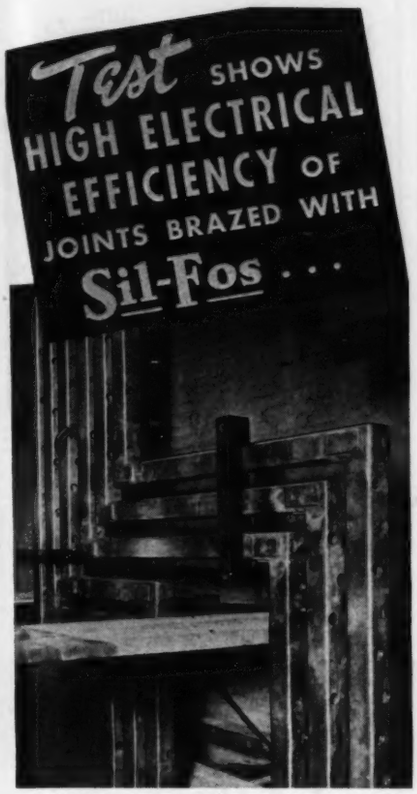
Arizona — Nevada
California — Oregon
Idaho — Utah
Montana — Washington

and parts of British Columbia and Wyoming, and enlargements of sub-transmission facilities in nine city areas.

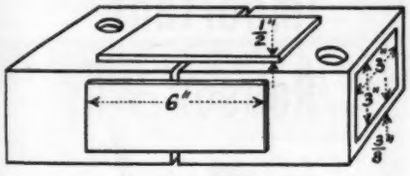
Those who need facts quickly—all those concerned with planning, building, regulating, selling to or studying electric systems in the Pacific area will find this map invaluable.

Write for details

McGraw-Hill Co. of Calif.
68 Post St., San Francisco



SIL-FOS strips .010" thick were placed between the butting ends of the bus tubes and under the 4 plates.



A RECENT bus bar installation at a large New York department store was brazed throughout with **Sil-Fos.**

This low temperature alloy was selected because it offered joints of low resistance, made installation easy and removed the need of servicing.

The completed system, under full load, operated on a very low temperature rise. A test on a 12" length of tube showed a drop of 4 millivolts at 2000 amperes, while on a similar length including a joint, the drop was **only 3½ millivolts.**

This is typical of the results you get in a properly designed **Sil-Fos** joint, whether for bus bar or other electrical service. You also get strong, permanent joints, free from internal oxidation. Small lap and fast application give big savings in materials, labor and gases. Test this efficient alloy on your work—write today for full details and Bulletin 54-EW.

HANDY AND HARMAN

82 Fulton St.
New York, N. Y.

Agents in Principal Cities

HANDY & HARMAN of Canada, Ltd., Toronto

Rural Construction Contracts Approved

Construction contracts approved between February 21 and March 27 have recently been announced by the Rural Electrification Administration. Among the outstanding contracts are the following:

GEORGIA — Okefenoke Rural Electric Membership Corp., Nahunta, H. A. Cox, supt., and Marcus C. Long, Alma, engineer, contract to Roy Richards, Carrollton, Ga., entire project, 240 miles of line, 528 members; bid $114,842.

IDAHO—Fall River Rural Electric Cooperative, Inc., Ashton, Walter Bratt, supt., and H. S. Nixon, 219 Omaha Grain Exchange Bldg., Omaha, Nebr., engineer, contract to Hagen and McClintic, Trinidad, Colo., 97 miles of line, 245 members; bid $66,181.

ILLINOIS—Monroe County Electric Cooperative, Inc., Waterloo, C. M. Douglas, supt., and Charles DeLeuw & Co., 20 North Wacker Drive, Chicago, engineer, contract to A. A. Electric Co., 3125 South 60th Court, Cicero, Ill., 191 miles of line, 399 members; bid $119,267.

INDIANA—Morgan County REMC, Martinsville, Robert E. Judah, supt., and Bevington-Williams, Inc., 730-39 Pythian Bldg., Indianapolis, Ind., engineer, contract to Duncan, Templeton & Co., Sturwelt Bldg., Martinsville, Ind., 149 miles of line, 392 members; bid $98,906.

KENTUCKY—Owen County Rural Electric Co-operative Corp., Owenton, Chester Roland, supt., and Ray W. Chanaberry, 1001-4 Realty Bldg., Louisville, engineer, contract to Shely Construction Co., 809 Manchester St., Lexington, Ky., 270 miles of line, 818 members; bid $165,639.

MINNESOTA — Lyon-Lincoln Electric Cooperative, Inc., Tyler, Sigvald C. Martensen, supt., and United Engineering Service, 1406 W. Lake St., Minneapolis, engineer, contract to Acme Construction Co. and Martin Wunderlich, 317 North Smith Av., St. Paul, Minn., 250 miles of line, 510 members; bid $156,653.

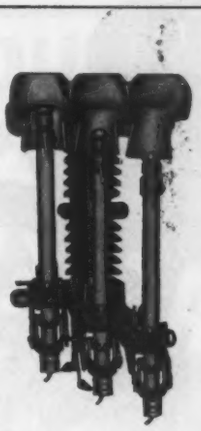
NEBRASKA—Thayer County Rural Public Power District, Hebron, Francis C. Cederholm, supt., and Davis and Schwob, 825 East 12th St., Crete, Nebr., engineer, contract to Roberts Construction Co., 1018 Terminal Bldg., Lincoln, Nebr., 175 miles of line, 248 members; bid $115,991.

NORTH CAROLINA—Pitt and Greene Electric Membership Corp., Farmville, John B. Lewis, manager, and G. C. Bullard, Davis Hotel, Farmwell, engineer, contract to Little Electric Co., Union, S. C., 82 miles of line, 319 members; bid $46,392.

OKLAHOMA—Kay Electric Co-operative, Blackwell, George A. Fry, manager, and S. B. Wadley, Kingfisher, Oklahoma, engineer, contract to H. J. Hall & Co., 3015 Grand Av., Dallas, Tex., 85 miles of line, 162 members; bid $48,456.

SOUTH CAROLINA—Santee Electric Cooperative, Inc., Kingstree, Walter E. Blackwell, supt., and J. E. McCrary Engineering Corp., 1408-22 Marietta St. Bldg., Atlanta, engineer, contract to Ivy H. Smith, 1325 San Mareo Blvd., Jacksonville, Fla., 134 miles of line, 215 members; bid $77,811.

TENNESSEE—Duck River Electric Membership Corp., Shelbyville, F. J. Wallheiser, supt., and P. M. Sullivan, Gallatin, engineer, contract to W. L. Hailey Co., 106 Cotton States Bldg., Nashville, for building 211 miles of line, 506 members; bid $142,641. Knoxville Electric Power and Water



Mistakeproof Reclosers

Here's a provable fact: Order one or more Rural Line Reclosing Matthews Fuswitches on 30 days trial—Freight prepaid.

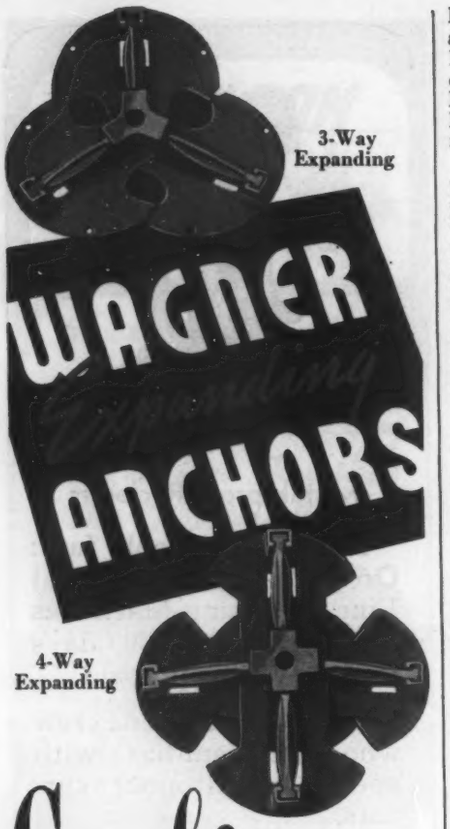
Give them to a line crew who are familiar with open type dropout cutouts.

Don't give them any instructions as to how to operate them.

If they are able to sincerely do anything wrong, send them back, freight charges collect, and our bill will be cancelled.

You can't lose. Will you send your order today? Ask for Bulletin 500-A.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.



Combine HOLDING POWER WITH EASY INSTALLATION

Knife-edged Wagner Anchor blades pierce cleanly into undisturbed earth as they expand . . . move in a straight line, not through an arc. Result . . . you get greater holding power, quicker, easier installation.

GET THESE WAGNER FEATURES

Ruggedly built . . . all parts malleable iron . . . patented guide posts direct blades, prevent side-slipping . . . Nut Retainer locks anchor to rod, prevents rod from slipping through anchor during installation, and permits salvage of rod if anchor is abandoned.

Wagner Malleable Products Co., Decatur, Ill.

2-Way, 3-Way, 4-Way Expanding

TWO NATION-WIDE DISTRIBUTORS
LOCKE INSULATOR CORP.
BALTIMORE, MARYLAND
LINE MATERIAL CO.
MILWAUKEE, WISCONSIN

Board, Max C. Bartlett, general manager, and Burns and McDonnell Engineering Co., 107 West Linwood Blvd., Kansas City, Mo., engineer, contract to Melvin F. Burgess, Inc., 804 Mercantile Trust Bldg., Baltimore, Md., 280 miles of line, 2,000 members; bid $214,217.

TEXAS—Tri-County Electric Co-operative, Inc., Azle, M. H. Skidmore, supt., and William G. Morrison, 2102 Bryan St., Dallas, Tex., engineer, contract to P. E. Workman, 1130 Liberty Bank Bldg., Dallas, 160 miles of line, 348 members; bid $81,321. Sam Houston Electric Co-operative, Livingston, Tom M. Drew, supt., and William G. Morrison, Dallas, engineer, contract to Midland Constructors, Inc., 205 West Wacker Drive, Chicago, 254 miles of line, 661 members; bid $150,183.

VERMONT — Vermont Electric Co-operative, Eden Mills, Harry D. Bowman, supt., and Walter N. Cook, Eden Mills, engineer, contract to Kenworthy and Taylor, Inc., 11 Spalding St., Everett Mass., 35 miles of line, 120 members; bid $28,383.

VIRGINIA — Tri-County Electric Co-operative, Leesburg, B. O. Vannort, 1207 Commercial Bang Bldg., Charlotte, N. C., engineer, contract to Day & Zimmermann, Packard Bldg., Philadelphia, 85 miles of line, 200 members; bid $52,399.

WASHINGTON — Stevens County Electric Co-operative, Inc., Colville, Alfred M. Osborne, supt., and Norman Mackenzie, Colville, engineer, contract to Homer G. Johnson, 709 Imperial Hotel, Portland, Ore., 292 miles of line, 564 members; bid $212,108. Pend Oreille Electric Co-operative, Inc., Newport, Victor P. Campbell, supt., and H. A. Sewell, Newport, engineer, contract to Bennett and Taylor, 598 San Fernando Road, Los Angeles, Calif., 189 miles of line, 324 members; bid $115,459.

WEST VIRGINIA — Harrison Rural Electrification Association, Inc., Clarksburg, Wilson J. Brent, supt., and Gibbs and Hill, Inc., Pennsylvania Station, New York City, engineer, contract to B. W. Jackson, Inc., 2510 Chamberlayne Av., Richmond, Va., 97 miles of line, 323 members; bid $65,135.

•

Agrees to Meet Uniform Accounts Requirements

Hearing on a show cause order against the Louisville Gas & Electric Co. in connection with its failure to comply with the Federal Power Commission's order of May 11, 1937, that it set up its accounts on an original cost basis, has been postponed.

Postponement follows the company's agreement to comply with the order by filing the required schedules on specified dates, full compliance to be completed on or before June 15.

•

FPC Defers Rate Hearing

Federal Power Commission has postponed to April 29 the hearing previously set for March 26 on the lawfulness of proposed increased rates to be charged by Arkansas-Missouri Power Corp. to the Arkansas Utilities Co.

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Electrical World

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WATTHOUR METER BEARINGS

QUALITY — backed by 40 years experience

PRICES—which deserve your consideration

Send for samples and prices

JOHN WORLEY JEWEL CO.
WALTHAM, MASS.

HIGH GRADE
HARD PORCELAIN
FOR
Electrical Specialties
High and Low Voltages

IMPERIAL
PORCELAIN WORKS
TRENTON, NEW JERSEY

TRICO COLORTOP FUSES
THE COLOR TELLS THE SIZE

INSTANTLY!

That's the way trouble-shooters, storekeepers and inspectors can "spot" the size of COLORTOPS. They also like the all-colored shock and vent-proof top — it's safe. And when a million in a million show when they blow — that's something.

When buying fuses — Compare PLUS VALUES
Write for sample

TRICO FUSE MFG. CO.
MILWAUKEE WISCONSIN

STAR INSULATING BEADS

Use **Lavolain** ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U. S. A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
TRENTON, N. J.

Vault Heat Conduction and Dissipation

[*Continued from page 49*]

effective draft head and the area of the ventilating openings. The net area of the inlet and exhaust vent openings in square feet where they are equal or the area of the smaller where unequal is

$$A = \frac{Q}{V}$$

where Q = the amount of air that must be circulated to absorb P_V kw. of loss.

V = the velocity of the air through the vent openings or through the smaller vent opening.

$$Q = \frac{1852\ P_V}{(t_3 - t_4)} \text{ cubic feet per minute.}$$

where P_V = the killowatts loss to be dissipated by ventilation.

t_3 = the temperature of the exhaust air in degrees Centigrade.

t_4 = the temperature of the inlet air or outside air in degrees Centigrade.

$$V = 481\sqrt{\frac{H\ (t_3 - t_4)}{T}} \text{ feet per minute.}$$

where H = the effective height in feet between the cool air inlet and the warm air exhaust vents.

T = the absolute temperature of the inlet or outside air in degrees Centigrade.

From the above three equations the following expression for the net area in square feet of the inlet and exhaust vents or the smaller of the two when different is obtained:

$$A = \frac{67.3\ P_V}{\sqrt{H\ (t_3 - t_4)^3}} \text{ square feet}$$

when T is taken to be 308 deg. C.

The curves of Fig. 3 are derived from this equation and provide a convenient way of computing the required area of the ventilating openings. An example will illustrate the method of using the curves.

The curves in Fig. 3 make no allowance for friction in the air ducts. If inlet shafts are used this loss of draft head may be appreciable, and unless the shaft or shafts are large in area with respect to the vent openings it may be desirable to increase the computed values of vent areas about 25 per cent. When all vent openings are in the vault roof and no inlet vent shaft is used the effective head probably will be less than the depth of the vault and a value of H equal to about 80 per cent of the vault depth may be used. The effective head should include any depth between the sidewalk or roadway surface and the roof of the vault.

It is obvious that the choice of the

ROUTINE TRANSFORMER CHECKING

ENABLES YOU TO KEEP INSTALLATIONS UP TO DATE BY KNOWING

LOAD VALUES AT ALL TIMES

Loads change in each locality and as they do transformers should also be changed. The load data you get through routine transformer checking tells you where on your system to remove or reduce the capacity of transformer installations. It tells you where the existing transformer capacity is overloaded or has too much connected load for safety.

Find out how all this helps you to keep investment down by reducing transformer investment—how you need use fewer sizes to meet all loads—how you keep down service interruptions, maintenance costs, and burnouts — write for bulletin.

HD

MAX-I-METER

The MAX-I-METER is a modern, lightweight, weatherproof, maximum-demand ammeter combined with a multi-range split core current transformer—4 ratios —which clamps over the conductor. No connections to make. No trailing leads. Ready for instant use—no support necessary. Accurate to 3% plus or minus. Not affected by ambient temperature. Can be readily reset and used immediately.

HD ELECTRIC CO.
100 W. MONROE ST. CHICAGO

factors involved in the use of these curves is subject to the judgment of the engineer using them. The losses to be dissipated should be based on the load cycle of the equipment installed in the vault. The inlet or outside air temperature used should be the temperature which may be expected to prevail during the time that the maximum losses occur. Calculations should be made for enough conditions to include periods of minimum permissible air temperature rise as well as periods of maximum losses. Vent opening areas computed by means of the curves of Fig. 3 have been compared with those of several actual installations and the computed areas closely checked those of vaults known to have adequate natural ventilation. If it is desired to have ample margin of safety the computed areas may be increased by 25 to 50 per cent, depending upon the accuracy with which the factors involved in the calculations are known and the margin desired.

The following tables of approximate full load losses of network transformers may be useful in determining the kilowatts to be dissipated from a vault:

Three-Phase Transformers Kva.	Approx. Full Load Losses in Watts Normal Loss Design	High Loss Design
150	2,600	2,900
225	3,400	3,900
300	4,200	5,000
450	6,000	7,200
500	6,600	7,900
600	7,400	9,100
750	8,800	11,000
1,000	11,000	14,000

Single-Phase Transformers Kva.	Approximate Full Load Losses in Watts
50	1,000
75	1,350
100	1,850
150	2,700
200	3,500
250	4,100
333	5,100

Approximate figures to use for the full load losses of heavy-duty network protectors when determining the losses to be dissipated from a vault are given in the following table:

Network Protector Rating in Amperes	Approx. Full Load Losses in Watts Subway Type	Open Type
800	600	600
1,200	600	600
1,600	800	600
2,000	800	1,200
2,500		1,200
3,000		1,200

When using the approximate loss figures from the above tables to determine the amount of the heat losses to be dissipated from a vault the cable loss can usually be neglected.

Great Interest Shown in Electric Cookery

Iowa Electric Light & Power Co. sales supervisors underestimated the interest of Cedar Rapids women in electric cookery roughly 2,000 per cent when ordering the oil silk aprons given away as attendance awards at their recent fourteen-week cooking school. They estimated that only 24 women would attend eleven of the fourteen weekly cooking sessions, but when 493 ladies claimed awards at the end of the school a rush order had to be sent out for enough aprons to cover the deficiency.

Total attendance at the school was 9,365. Perfect attendance was rated by 179 women, with heaviest attendance at any one session (there were four identical sessions each week) being 253. Smallest attendance at any session was 111 on a rainy Thursday night.

It speaks well for the Cedar Rapids cooking school that some women brought their lunches and came as early as 4:30 p.m., to be sure of a seat at the 7 p.m. class, and that some of the dignified matrons, who could not find seats, so far forgot their dignity as to sit on stepladders with a wastebasket for a footstool so they would not miss the session.

•

Orders License Surrender

Application by the Southern California Edison Co., Ltd., for extension of time to 1945 for construction of a transmission line affecting lands of the United States within the Los Padros National Forest has been denied by the Federal Power Commission. The board has ordered the company to surrender the license within thirty days. The line was planned to supply power for the development of oil wells, but such development has not occurred.

License was issued in 1930 and time for construction was extended three times. Southern California Edison Co. can apply for a new license, it was pointed out, when it is ready to proceed with construction.

•

Jewelers Sell Appliances

Jewelers are the latest merchants to invade the electrical appliance merchandising field at Vancouver, B. C. Members of the electrical industry raised their eyebrows when musical and furniture dealers entered this realm of merchandising. Now they are joined by these same furniture and musical dealers in expressions of surprise at the latest development.

"SEARCHLIGHT" EMPLOYMENT and OTHER BUSINESS OPPORTUNITIES

UNDISPLAYED:

Positions Wanted, 5 cents a word, minimum charge $1.00 an insertion.

(See ¶ on Box Numbers.)

Positions Vacant and all other classifications, 10 cents a word, minimum $2.

Box Numbers in care of our New York, Chicago and San Francisco Offices count as 10 words in addition to advertising copy.

Replies are forwarded each day as received at each of the offices mentioned without additional charge.

Discount of 10% is allowed if full payment is made in advance for 4 consecutive insertions.

DISPLAYED:

Space is sold by the "inch," with 30 inches to a page. (An "inch" measures approximately ⅞ inch high by 2¼ inches wide.) Rates are from $6.50 to $5.00 an inch, depending on the total space used.

POSITIONS VACANT

ENGINEER experienced in staking R E A distribution lines. Box 24, East Montpelier, Vermont.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 30 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

EXECUTIVES $2,400-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who either seek a change, or the opportunity of considering one, under conditions assuring, if employed, full protection to present position. Send name and address only for details. Jira Thayer Jennings, Dept. G—9 Center Street, New Haven, Conn.

POSITIONS WANTED

(See also "Selling Opportunities Wanted")

UTILITY RIGHT-OF-WAY Agents—electrical distribution—legal and engineering knowledge. PW-746, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER, Degree, Licensed New York State, 20 years experience, Powerhouse, Substation, transmission Line Design; Industrial light, power; wiring plans, specifications, correspondence, estimating, supervision, inspection office buildings, banks, theatres, hotels, schools, apartment houses, cost work large contracts. Available May. PW-750, Electrical World, 330 W. 42nd St., New York, N. Y.

E.E. WITH THOROUGH EXPERIENCE in design, construction and working up of Rural Lines. Will make excellent manager of Co-op. Experienced in design, maintenance, and construction of distribution and transmission lines, transformer and motor rebuilding, load check, low voltage correction. Long maintenance experience in electrical equipment. Oil field design of generating plants, lines, and pumping. PW-749, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

POWER SALES ENGINEER with distribution engineering background desires new connection. Six years experience diesel and steam competition, industrial power applications. Details training, experience, references on request. Now employed. PW-751, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

(Continued on opposite page)